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MODELING INCREMENTAL INITIAL ACTIVE DUTY CONTINUATION PROBABILITIES IN THE SELECTED MARINE CORPS RESERVE

by

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March 2014

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The analysis uses TFDW data for NPS accessions into the SMCR. This research analyzes differences in attainment of annual benchmarks as a means for identifying differences in the subpopulations. The analysis was performed using multivariate logistic regression for identified annual milestones from 12 to 72 months of time in service. Explanatory variables include IIADT affiliation, demographics, education, geographic region, aptitude, military occupational specialty, military performance, and FY.

IIADT program affiliation was found to have differing effects on the probability of continuation to annual milestones. After a positive effect on continuation to 12 months, IIADT affiliation is associated with a negative effect in continuation probability through 48 months. At the 60 month point, differences between IIADT Marines and those not affiliated with IIADT are not statistically significant. We recommend further research to quantify the presumed benefits of the IIADT program.

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LIST OF ACRONYMS AND ABBREVIATIONS

AC	active component
AIC	Akaike's Information Criterion
AR	active reserve
CFT	combat fitness test
DOD	Department of Defense
FY	fiscal year
IADT	Initial Active Duty Training
IIADT	Incremental Initial Active Duty Training
IMA	Individual Mobilization Augmentees
IRR	Individual Ready Reserve
M&RA	Manpower and Reserve Affairs
MARFORRES	Marine Forces Reserve
MCO	Marine Corps Order
MCRC	Marine Corps Recruiting Command
MOS	military occupational specialty
MSO	Military Service Obligation
OAP	Officer Accession Programs
PEBD	pay entry base date
PEF	program enlisted for
PEF	program enlisted for
PFT	physical fitness test
RA	Reserve Affairs
RAP	Reserve Affairs Personnel, Plans, and Policy
RMSE	root mean squared error
ROC	receiver operating characteristic
ROEP	Reserve Optional Enlistment Program
SMCR	Selected Marine Corps Reserve
TFDW	Total Force Data Warehouse

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School. My exposure to each of you has created a fulfilling experience that I will cherish. I hope that the feeling is mutual, and the relationships formed are persistent. Semper Fly, and Keep the Spinning Side Up!

I. INTRODUCTION

The goal of this thesis is to determine if there is a difference in continuation between non-prior service (NPS) Marines in the Selected Marine Corps Reserve (SMCR), based on affiliation with the Incremental Initial Active Duty program (IIADT). The analysis centers on controlling for econometric factors affecting NPS reserve Marines, in order to isolate and evaluate the existence of any effect attributed to IIADT affiliation. We consider only those NPS Marine reservists serving an enlistment contract specifying a six year drilling obligation followed by another two years in the individual ready reserves (IRR). We find that IIADT Marines are statistically no different for the first 12 months, but have statistically lower continuation to subsequent milestones.

We also seek to determine the existence of any trends in general continuation behavior since 2001. We find that after controlling for a number of other factors, that the continuation behavior for NPS reserve Marines has steadily worsened. Finally, we quantify a number of the most important determinants of continuation.

A. BACKGROUND

According to Marine Corps Order 1001R.54E:

> The IIADT Program was established to attract highly qualified NPS applicants for enlistment in the Marine Corps Reserve. It permits high school seniors enrolled in college, to enlist and complete recruit training during the summer between high school graduation and the freshman year of college, and return to inactive duty with the parent Selected Marine Corps Reserve (SMCR) unit. College students will commence participation during the summer following their current academic year. Thereafter, second and third increment training will be completed during the summer(s) following the current academic year.[1]

In its current state, the program remains un-validated. Particularly, the question of whether or not IIADT accessions are more "highly qualified"[2] than their single increment

[1] United States Marine Corps, "Marine Corps Order 1001R.54E: Marine Corps Reserve Incremental Initial Active Duty Training (IIADT) Program" May 1999, 2, http://community.marines.mil/news/publications/Documents/MCO%201001R.54E.pdf

[2] Ibid.

accession counterparts, has heretofore remained unanswered. More specifically, are IIADT affiliates different enough to warrant maintaining the program? Reserve Affairs (RA) is interested in determining the value of the IIADT program; this thesis provides relevant information regarding that question.

1. Marine Corps Reserve Organization

This section includes brief descriptions and organization of the Marine Corps reserve components in order to provide an overall understanding of the structural organization. The focus of this thesis is the NPS component of the SMCR; this is why the SMCR is the focus of this section.

The Marine Corps Reserve is a unique blend of both prior and non-prior service individuals spread across a range of contract specifics whose complexity is beyond the realm of this thesis. What relevant to this thesis are the subpopulations within the SMCR. Particularly, the NPS portion of the SMCR is of interest because the IIADT option is only available to new enlisted accessions.

The mission of the Reserve Component of the Marine Corps is to "augment and reinforce the Active Component (AC) with trained units and qualified individuals in a time of war or national emergency, and at such other times as national security may require."[3] The Marine Corps Reserve is composed of three main components: The Ready Reserve, the Standby Reserve, and the Retired Reserve. For sake of brevity, we will only discuss the SMCR here. For a full description of the components of the Marine Corps Reserve refer to Marine Corps Order 1001R.1K, the Marine Corps Reserve *Administrative Management Manual*.

Figure 1 presents a broad overview of the Marine Corps Reserve, including the portions not discussed here.

[3] United States Marine Corps, *Marine Corps Order 1001R.1K: Marine Corps Reserve Administrative Management Manual (Short Title: MCRAMM)*, March 2009, 1-2, http://www.marines.mil/Portals/59/Publications/MCO%201001R.1K.pdf

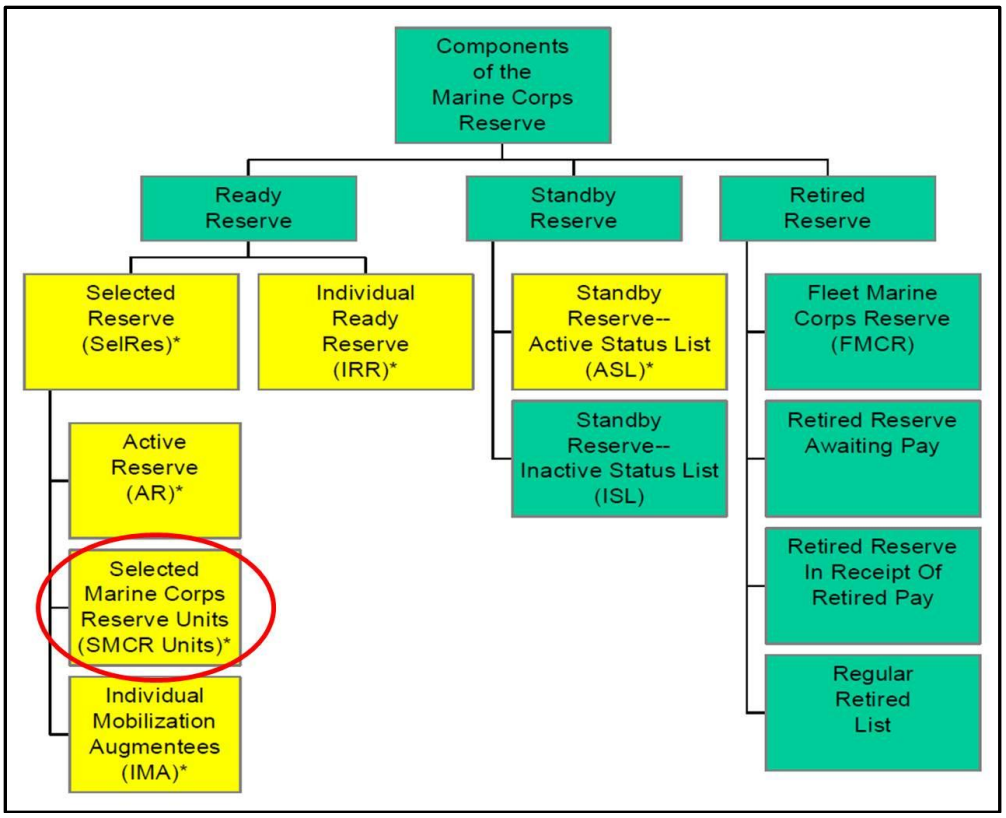

Figure 1. Organization of the Marine Corps Reserves[4]

2. Selected Marine Corps Reserve

The SMCR includes the individual units that mirror the active component (AC) in organization and mission. Units include the 4th Marine Division, 4th Marine Logistics Group, 4th Marine Aircraft Wing, and subordinate units, as well as headquarters level MARFORRES. SMCR units are those in which individual reservists complete their monthly drill requirements. The units are comprised of Marines with prior active duty service, as well as those who enter the Marine Corps directly into the SMCR.

a. Prior Service Reservists

The SMCR is not comprised solely of NPS individuals, as many reserve Marines have completed a contract in the active component of the Marine Corps prior to joining the SMCR. Many prior service Marines enter the SMCR as corporals and sergeants.

[4] Ibid., 1-6.

b. Non-Prior Service Reservists

The majority of SMCR accessions are NPS. NPS reservists are those Marines who enter directly into the SMCR without having any active or reserve service in the Marine Corps or any other branch of service. Roughly 60 percent of all reserve component enlisted accessions are NPS.[5]

NPS accessions enter the SMCR via a range of contractual time obligations, as outlined by Marine Corps Order 1133R.26E, or Reserve Optional Enlistment Program (ROEP). Contract lengths and terms under ROEP range from 3x5 to 6x2 in terms of initial contract followed by IRR commitment as outlined in Table 1. A 6x2 contract means that a Marine has a six year drilling obligation and a two year IRR obligation. All contracts, however, total eight years of service to the Marine Reserves.

Contract Terms	SMCR Obligation	IRR Obligation
3x5	3	5
4x4	4	4
5x3	5	3
6x2	6	2

Table 1. Enlistment Contract Terms (as specified by MCO 1133R.26E)

(1) Single Increment Initial Active Duty Training. Individuals completing all of their initial level training (recruit training, MCT, and military occupational specialty (MOS) school) in a single increment fall into this category. Individuals completing the entire initial training requirement in a single increment are eligible to serve in any contract category specified in the ROEP. There are a few exceptions based on IADT length.[6]

[5] Ibid., 2-2.

[6] United States Marine Corps, "Marine Corps Order 1133R.26E: Reserve Optional Enlistment Program (ROEP)," February 1999, 2, http://www.marines.mil/Portals/59/Publications/MCO%201133R.26E.pdf

(2) IIADT. IIADT accessions, commonly referred to as Split-Is, complete initial entry training in two or three increments depending on MOS.[7] The initial training increment, recruit training, is completed during the summer immediately following the first academic year (after graduation for high school seniors, and after the spring semester for college students). IIADT Marines then begin monthly drill requirements until the following summer, when they attend a formal school to gain training in their primary MOS. During the third summer, some IIADT Marines attend MCT. After completion, they are considered fully trained, and continue drilling until their mandatory drill stop date. Due to the length of time required for split-Is to become fully trained (recruit training, Marine combat training, MOS school), the only option for contract length terms is 6x2.[8]

The benefit of the IIADT program is that it attracts those high school seniors, and individuals already enrolled in college, to enlist in the SMCR without interrupting their education. Since training is conducted during the summer, individuals do not miss any school to attend initial active duty training. As such, the program allows the SMCR to be more attractive to a portion of the population that would otherwise choose continued education to military service.

B. BENEFIT OF THE STUDY

Few studies examine the differences in continuation behavior among reservists, and even fewer examine differences between sub populations of the SMCR. In particular there are no studies centered on the IIADT program. This study provides information on the IIADT program to determine if it should be modified, cancelled, or if it should remain the same. Information contained herein provides insight into the behavior differences between IIADT Marines and those not affiliated with the IIADT.

The results of the study are relevant to Marine Forces Reserve (MARFORRES), RA and the Marine Corps Recruiting Command (MCRC), because all have a vested

[7] Infantry MOS training is complete in two increments, as these MOSs do not attend MCT.

[8] United States Marine Corps, "Marine Corps Order 1001R.54E: Marine Corps Reserve Incremental Initial Active Duty Training (IIADT) Program" May 1999, 4.c, http://www.marines.mil/Portals/59/Publications/MCO%201001R.54E.pdf

interest in the continuation behavior of SMCR Marines. The information gathered and the data analyzed by this research provides stakeholders with a clearer picture of potential differences between policy intent and execution of those policies. Due to current fiscal constraints, all attempts at improving recruiting, training, and retention policies should be examined.

C. ORGANIZATION OF THE STUDY

Chapter II is a literature review of relevant Marine Corps orders, selected reserves focused continuation studies, and prior research on Marine Corps Reserve manpower issues. Chapter III is a discussion of the collected data, identification and description of the variables developed for the study, and brief discussion of methodology. Chapter IV presents model development, specification, and validation, as well as discusses regression results and subsequent analysis. Chapter V offers analytical conclusions and recommendations.

II. LITERATURE REVIEW

A. INTRODUCTION

The large majority of research that investigates the continuation behavior of military members centers on the active component. Although relatively few in number, over the past decade there have been several studies that address the attrition, retention, and continuation behavior of individuals in the Selected Marine Corps Reserves (SMCR). These studies have proven helpful in providing insight to some of the factors affecting Marine reservists that may be different from the active component. None, however, have addressed the continuation behavior of any specific population within the SMCR. More specifically, none have addressed the behavior differences of the Incremental Initial Active Duty (IIADT) portion of the Selected Marine Corps Reserves (SMCR). RAND Corporation and the Center for Naval Analysis (CNA) do conduct continuation studies, but these studies have been large scope and focus on the active component. For example Quester et al., 2008, Lien et al., 2008, and Burkhauser et al., 2014 are examples of large scale studies completed by RAND and CNA that focus on the active component of the military. Graduate students are the primary executors of research regarding military reserves studies, nearly all of which originate from Naval Postgraduate School students

The goal of this literature review is to examine the more recent and relevant studies relating to the continuation behavior of SMCR Marines, and determine a basis to apply those findings to the IIADT portion. Additionally, this literature review identifies gaps in existing research that this thesis fills. Moreover, the intent is to develop a theoretical basis for constructing a valid conceptual multivariate framework to accurately predict the behavior of SMCR IIADT accessions. This literature includes a representative assortment of studies examining factors that explain the retention, attrition, and continuation behavior of individuals in the selected reserves as relevant to my thesis. Further, this literature review examines relevant service orders and Department of Defense (DOD) directives, and identifies programmatic changes that may affect the continuation behavior differently among the different SMCR populations.

B. MARINE CORPS ORDER 1001R.54E

Although under revision during this research, the guidelines set forth in Marine Corps Order 1001R.54E (MCO 1001R.54E) govern the execution of the IIADT program during the period from which our data are collected.[9] Specifically, we evaluate the order for programmatic issues that could predispose the IIADT program to higher rates of attrition or other continuation issues. While unable to identify any issues as described, we note that paragraph 7 (a) of the order does allow for individuals set back in training to be either discharged or receive contractual modification.[10] Individuals who attain a contractual modification in accordance with the guidelines of the order, are not assigned a different program enlisted for (PEF) code. As such these individuals are easily identified in the data set, yet they remain affiliated with the IIADT program through their respective PEF. During the review, no revisions are noted, and no programmatic issues affecting continuation in the SMCR are noted in the order.[11]

C. INDEPENDENT STUDIES

We focus our attention on studies that examine retention and attrition in the SMCR. Continuation within the SMCR is based primarily upon a set of conscious decisions that can be considered similar to retention decisions for the purposes of modeling. Additionally, attrition from the program can be broken down into two separate classes: wasteful and acceptable. For purposes of this study, all attrition is considered wasteful since exiting the IIADT program prior to completion of a contract is the heart of the issue of interest.

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[9] Ibid., 5.

[10] MCO 1001R.54E allows for recruits set back in training to receive contractual modifications. Setbacks can be for medical reasons, failure to progress, etc. Contractual modifications include discharge from the Marine Corps, transfer from IIADT to single increment SMCR entry (i.e., all training requirements are met prior to the recruit returning to his/her home of record, or entering service in the active component).

[11] United States Marine Corps, "Marine Corps Order 1001R.54E: Marine Corps Reserve Incremental Initial Active Duty Training (IIADT) Program," May 1999, 4, http://www.marines.mil/Portals/59/Publications/MCO%201001R.54E.pdf

1. United States Marine Corps Reserve First Term Attrition Characteristics

The Herschelman study addresses first term reserve attrition during a time period that spans the events of September 11, 2001 (9/11).[12] Although the methodology and thoroughness are admirable, the study centers around population differences based on the events of September 11. The horrific events of that day had different and immeasurable effects on every individual. As such, the different effects on individuals may be expressed in both observable and unobservable manners. Fallout effects commonly attributed to the events of September 11, 2001 range from increased regional unemployment rates and an increased sense of patriotism, to little or no change in the unemployment rate, and feelings of indifference about the events. Moreover, the study lumps many factors that could potentially affect attrition into a single explanatory variable: region. Determinants of retention and attrition vary widely across the nation. More specifically, determinants of attrition behavior can be determined by regional affiliation, such as those utilized by the U.S. census bureau. Herschelman utilizes the census bureau regions as a means of capturing localized regional effects of factors like unemployment, taste for the military, and the myriad of effects that these unobservable factors have on attrition characteristics.[13]

Our study centers around individuals recruited only in the post September 11, 2001 timeframe, creating a more homogeneous sample population with respect to 9/11. Specifically, we utilize accessions data collected beginning in fiscal year (FY) 2002 and running through the end of FY 2011. Additionally, we examine differences between two subpopulations of the SMCR: IIADT affiliates and those not affiliated with the IIADT program.

[12] Philip R. Herschelman, "United States Marine Corps Reserve First Term Attrition Characteristics" (master's thesis, Naval Postgraduate School, 2012) 1.

[13] Ibid., 7–8.

2. Retention in the Guard and Reserve Components

Hansen and MacLeod address guard and reserve component attrition and retention drivers and issues across the events of September 11, 2001, much as Herschelman.[14] Hansen and MacLeod do not concede that there potentially exists a difference in continuation rates in the post 9/11 military. In fact, while using data gathered from FY 2000–2003, the study includes dummy variables for year effects but discounts the results, attributing the year effects to increases in military pay and other directly measureable values. They do not concede the possibility that there could be a retention effect due to the intrinsic and extrinsic effects of the events of 9/11, the war in Afghanistan, or the war in Iraq. The authors discuss the unemployment rate as a significant factor affecting retention in the reserves. Specifically, they address the unemployment rate in terms of earning potential of the individual reservist as the unemployment level fluctuates. They find that retention probability of an individual increases as education increases, up to the point where the reservist receives a degree. At that point, retention probability drops.[15] Similarly, they address occupational specialty in terms of applicability in the civilian labor market and its effect on retention, but the authors make no mention of measure of applicability. This leaves the reader to wonder what assumptions were made in terms of occupational applicability.[16]

Hansen and Macleod find that retention increases as education increases, to the point at which a degree is earned.[17] Hansen and MacLeod, however, address a different population than we examine, in that they do not address subpopulations in the reserves, such as the IIADT. Lastly, as both studies to this point have addressed, this study includes occupational specialty to capture its effect on continuation.

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[14] Hansen, Michael L., and Ian D. MacLeod, *Retention in the Reserve and Guard Components* (Alexandria, VA: Center for Naval Analysis, 2004), 7.

[15] Ibid., 3.

[16] Ibid., 8.

[17] Ibid., 3.

3. Forecasting Retention in the United States Marine Corps Reserve

In his 2005 thesis, Schumacher analyzes retention in the SMCR by utilizing logistic regression as a means of predicting the "stay or go" decision.[18] Schumacher analyzes the conscious retention decisions of SMCR Marines and, as such, his work is highly relevant as we examine the behavior differences of SMCR sub-populations. Specifically, the thorough organization, dissection and analysis of data in Schumacher's study are compelling, and closely parallel the hypothesized model for our study. One potential shortfall in the study is that the author uses data that spans from 1988–1992 and 1996–2004, yet he does not address the potential effect of the events of 9/11 on the retention decisions of Marine reservists.[19] Although very detailed in his data categorization and classification, wherein the author clearly addresses difference in pre- and post- Gulf War differences, he does not account for potential changes based on the events of 9/11.[20] It is possible that the author assumed that sufficient data are not available to address post 9/11 differences, as it is completed in 2005.

In contrast to the Schumacher study, the data collected for this study are homogeneous in that they are all collected from the post 9/11 era. Additionally, whereas Schumacher uses a continuous variable in the number of days activated as its primary explanatory variable in the "stay or go"[21] decision, this study uses a binary variable contingent upon IIADT affiliation as its primary descriptive variable of interest. Although data pertaining to deployments and activations are available, comparison of deployments or activations on the subpopulations of the SMCR in our study is inappropriate, because IIADT participants potentially have a shorter time horizon during which they can deploy.[22] Specifically, they are likely to deploy during a potentially shorter portion of their enlistment than those who complete all of their initial active duty training in a single

[18] Joseph F. Schumacher, "Forecasting Retention in the United States Marine Corps Reserve" (master's thesis, Naval Postgraduate School, 2005), 20.

[19] Ibid., 23.

[20] Ibid., 20.

[21] Ibid., 6.

[22] Commanding officers maintain the prerogative to deploy or not deploy individual Marines based on readiness of the individual. IIADT members who are not yet fully trained can be viewed as a liability during deployment and subsequently left in the remaining behind element of a deployed unit.

increment. Moreover, reserve deployments typically are highly scrutinized for length due to the increased cost of deploying a reserve unit.[23] This means the variable *number of days deployed* approaches a point of invariability due to fiscal constraint.

4. Development of a Markov Model for Forecasting Continuation Rates for Enlisted Prior Service and Non-Prior Service Personnel in the Selective Marine Corps Reserve

The Erhardt study, although both non-prior service Marines and prior service Marines are included, is compelling in its evaluation of factors affecting transition rates in the SMCR population.[24] Specifically, the Erhardt study is the only reserve study reviewed, where a measure of commitment is included. Although not specifically evaluated as such, Erhardt uses completion of monthly drill requirements, ultimately setting the precedent to include similar measures. Previously cited studies do mention disenchantment or disengagement from the Marine Corps as an unobservable affecting retention in the Selective Marine Corps Reserve (SMCR), yet none include any explicit means of identifying potential markers for these symptoms. With the SMCR, a low drill obligation completion rate can serve as an indicator for disengagement,[25] but it may not necessarily be the best indicator that exists.

As data supports, our study makes use of additional performance metrics to identify commitment among participants across the SMCR. The Erhardt study relies upon drill completion rate to measure dedication. However, the fact that a Marine shows up to drill when told to do so does not necessarily provide the best measure for dedication, rather it identifies an individual who can follow orders. Sufficient data to more accurately measure commitment or dedication are available, and easily useable by any number of statistical analysis software packages. Variables such as proficiency and conduct marks (Pros/Cons), Physical Fitness Test (PFT) score or class, and Combat Fitness Test (CFT)

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[23] Jennifer C. Buck, "The Cost of the Reserves," in *The New Guard and Reserve*, ed. John D. Winkler and Barbara A. Bicksler, 175–185 (San Ramone: Falcon Books, 2008), 179.

[24] Bruce J. Erhardt Jr., "Development of a Markov Model for Forecasting Continuation Rates for Enlisted Prior Service and Non-Prior Service Personnel in the Selective Marine Corps Reserve" (master's thesis, Naval Postgraduate School, 2012), 21.

[25] Ibid.

score or class can all be used as methods of capturing the dedication of an individual Marine. These variables gauge job performance, conduct, and physical fitness and are an effective way to estimate commitment and dedication.

5. Patterns of Marine Corps Reserve Continuation Behavior: Pre- and Post-9/11

In his 2011 thesis, Lizarraga addresses the continuation behavior of SMCR Marines beyond their initial obligation period. Specifically, he examines his data set for individuals who remain in the SMCR after their initial drilling obligation is complete at 72 months. The author identifies three cohorts of pre- 9/11 Marines, 9/11 overlap Marines, and post-9/11 Marines based on enlistment date. [26] Division of the data into cohorts by timeframe allows the author to control for differences in expectations of the reserves based on trends in deployment before, and in support of, the Global War on Terror. He finds statistical significance in many of his demographics categories and his military performance variables. Additionally, the author identifies continuation differences based on cohort that he attributes to realistic deployment expectations.[27]

Much like Lizarraga, we examine the continuation behavior of SMCR Marines; however, our study is different in four primary ways. First, we identify continuation differently by identifying annual milestones in the prevalent 6x2 contract. Second, we evaluate individuals from only the post-9/11 era. Third, we do not examine continuation rates across the SMCR, rather we examine differences between sub-populations of SMCR Marines: IIADT affiliates, and those not affiliated with the IIADT program. Last, we do not use deployment data because IIADT Marines are able to deploy for a shorter portion of their 6 year obligor commitment. This fact renders this approach inappropriate for our study.

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[26] Joseph M. Lizarraga, "Patterns of Marine Corps Reserve Continuation Behavior: Pre- and Post-9/11" (master's thesis, Naval Postgraduate School, 2011), 60, http://calhoun.nps.edu/public/bitstream/handle/10945/5778/11Mar_Lizarraga.pdf?sequence=1.

[27] Ibid., 104.

D. SUMMARY

The studies included in this review provide a relevant basis for determining methods and covariates for inclusion into a multivariate framework capable of describing behavior differences amongst the differing SMCR populations. Furthermore, the preferred method for estimating continuation behavior is via logistic regression. Logistic regression is the preferred method as it estimates the effects of the different determinants, and it also determines the overall probability of continuation in the SMCR of the average individual accession. As is the case in previous studies, this study creates FY cohorts to identify any existence of a changing trend in continuation over time. Moreover, we examine the existence or non-existence of a difference in continuation behavior based on IIADT status.

III. DATA AND METHODOLOGY

A. INTRODUCTION

This chapter discusses the source and type of data we use in the multivariate models for predicting behavior, and the methodology we use to clean and codify those data. It further provides descriptions of the variables, their importance to the model, and summary statistics where appropriate.

B. DATA SOURCE

Individual level data are retrieved from the Reserve Affairs Division (RA) at Manpower and Reserve Affairs (M&RA), covering the span from FY 2002–11. Data received from RA are collected from the Marine Corps Total Force Data Warehouse (TFDW). Individual level panel data are cleansed of Personally Identifiable Information (PII) prior to receipt from RA, and individuals are assigned record identifiers that remained static across the panel. Remaining native variables collected are identified via M&RA naming convention, and coded in accordance with the M&RA TFDW Code Lookup reference.[28]

C. DATA DESCRIPTION

The original data set consists of more than 10.4 million observations. Each record is a snapshot of an individual Marine's service record at either annual, quarterly, or monthly intervals depending on the period from which the data originated. The data includes individuals with pay entry base dates (PEBD) ranging from 1 November 1938 through 19 September 2012, as well as 1.3 million missing values. Data fields include information relating to both pre-military information (primarily demographics), as well as information relating to the individual Marines' military performance. Pre-military data fields included cover the range from descriptive demographic data (gender, race, etc.), to education level, state of residence and dependent information. Information fields

[28] United States Marine Corps, Manpower & Reserve Affairs, "Manpower Codes Lookup," accessed February 12, 2014, https://www.manpower.usmc.mil/lookups/lookups/lookups.action.

pertaining to an individual's military career include fields such as rank, Armed Forces Qualification Test (AFQT) score, proficiency and conduct marks, and additional fields such as physical fitness, and combat fitness test scores.

To clean the data set, we first drop irrelevant data (those observations with either too early a pay entry base date [PEBD], or missing value for PEBD), which reduces the data set by over 4.5 million observations. Similarly, since the last date for which we have data is 30 March, 2012, we drop all personnel whose PEBD is after 31 March 2011 in order to ensure that individuals are able to reach at least one continuation milestone. This right censoring operation results in dropping another 108,009 observations from the data set. (Table 2)

Another issue with the data is that they are not filtered for duty status. Because we are only interested in non-prior service SMCR affiliates, we drop another 710,650 observations for individuals under different contract terms. An additional 1.1 million observations are dropped due to being unmatched data after merging the many data sets received from TFDW (Table 2). The unmatched data that are dropped are those with no social security number, or no performance or contract information, and are mostly incomplete due to not merging.

At this point the data set contains Marines from the desired timeframe and with sufficiently valid information, but there exist multiple records for each individual Marine. We further reduce the dataset to contain a single record for each individual Marine that maintains education level at enlistment and contains the latest data for remaining fields. Due to this collapse reduction, we are left with a data set consisting of 48,958 independent, observations.

Variable	Reason Observations Dropped	Beginning Observations	Dropped Observations	Remaining Observations
PEBD	PEBD too early	10,385,042	3,265,634	7,119,408
PEBD	PEBD Missing	7,119,408	1,285,019	5,834,389
PEBD	PEBD too late	5,834,389	108,009	5,726,380
Res_Comp_Code	Wrong Duty Status	5,726,380	710,650	5,015,730
Unmerged	Unmatched Data	5,015,730	1,119,007	3,896,723
All	Collapse operation	3,896,723	-	48,958

Table 2. Data Reductions Due to Cleaning and Collapsing Operations

Finally, the data are separated into different sets for evaluation to each milestone. We construct total months of service completed during the FY 2002–2012 timeframe by using an individual's pay entry base date (PEBD), and the last appearance of the individual in the data set. Using the total months of service completed, we are able to assign individual observations to sub-populations based on whether or not they reach the incremental milestones. In order to isolate the marginal probability of attaining the given milestone, a Marine is only evaluated for survival to any milestone if they first reached the previous milestone. Subsequent data sets are evaluated similarly. Moreover, individuals are also removed from the data if they do not have sufficient time from their PEBD to their last appearance in the data to attain the subsequent milestones. As such, the number of observations in each data set for each milestone are aligned as indicated in Table 3. Lastly, there exist more than 7,600 values of zero entered into *avg_pros* or *avg_cons*, causing skewed data sets if left in place. The proficiency and conduct values of zero are removed from the 12- through 48-month data sets, but left in the 60- and 72-month data sets, as *avg_pros* and *avg_cons* are not included in the last two models.

12 Month Model	24 Month Model	36 Month Model	48 Month Model	60 Month Model	72 Month Model
41,305	36,833	30,426	25,018	21,487	15,918

Table 3. Individual Observations by Data Set

D. DEPENDENT VARIABLES

Continuation in the SMCR is affected by innumerable actions that the individual Marine takes. Different decisions made and actions taken either carry the individual

further into service cause their service to stop. Decisions and actions can be as intentional and conscious as the decision to use illegal drugs, or to stop attending monthly drill. They can also be less intentional and subtle, like changes in attitude, or slowly allowing physical fitness standards to be ignored. Additionally, as attitudes, dedication, and external influences can change over time, the propensity of an individual to continue in the military service can potentially change as well. As such, this study examines continuation by using 12 month intervals extending from 12 months to 72 months in order to account for each year of a 6x2 contract. Using the total months of service completed, we assign the binary success and failure values to individual observations based on whether or not they reach the incremental milestones. Individual milestone variables are labeled *survive_12, survive_24, survive_36* etc. based on the increment response period being examined.

E. DESCRIPTIVE VARIABLES

1. Native Variables

a. Present Pay Grade

Included in the original data, are the present pay grades of individual Marines as they trend over time by sequence number. Although not included in any models, examination here provides a superficial look at the composition of our data set by pay grade (Figure 2). Interestingly, there exist individuals in the 60 month and 72 month models whose rank is less than E4.[29] Regardless, the relative percentage of individuals whose pay grade is E5 (sergeant) or higher steadily increases as months of service increase.

[29] With the institution of the stop loss stop move policy, and its applicability to the SMCR as outlined by MARADMIN 156/03, promotion rates slowed as individuals built up in the manpower system.

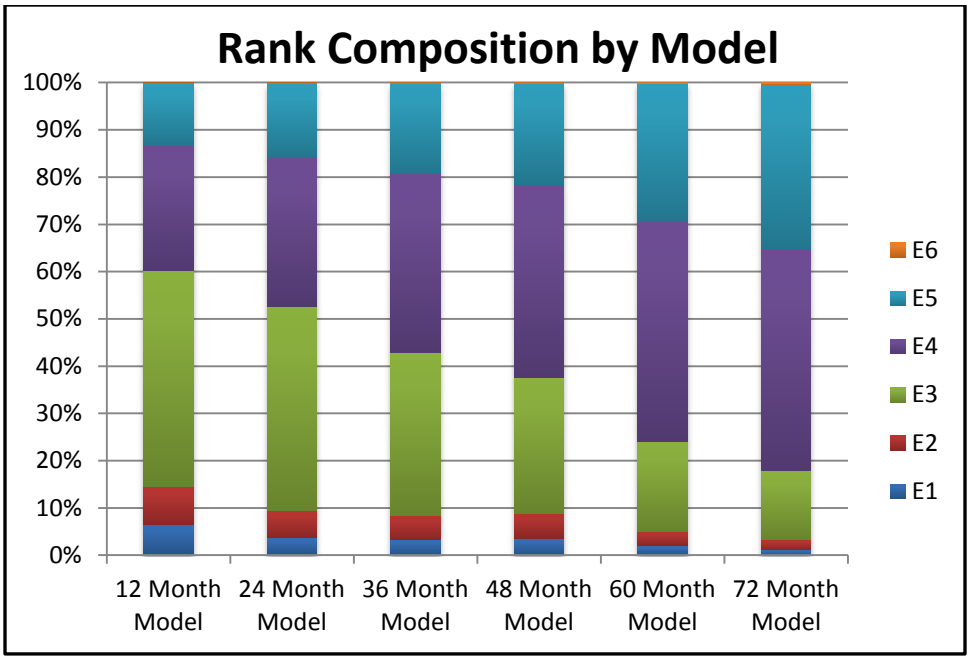

Figure 2. Pay Grade Composition by Relative Percentage and Data Set

b. Gender

We include the dummy variable *male* in order to capture the anticipated effect of gender on continuation. Previous studies, such as the Herschelman thesis[30] and Schumacher thesis,[31] indicate statistically significant differences in continuation and attrition characteristics based on gender. As Marine Corps decision makers continue to refine policy and with open additional occupational specialty fields to females,[32] it is imperative that maximum fidelity be maintained with respect to any gender differences. Moreover, it is another means for differentiation among observations for the regression. Descriptive data concerning the gender composition of the data sets are included in Tables 4 and 5.

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[30] Phillip R. Herschelman, "United States Marine Corps Reserve First Term Attrition Characteristics" (master's thesis, Naval Postgraduate School, 2012), 52.

[31] Joseph F. Schumacher, "Forecasting Retention in the United States Marine Corps Reserve" (master's thesis, Naval Postgraduate School, 2005), 32.

[32] United States Marine Corps, "ALMAR 012/12: Assignment of Women to Ground Combat Units," April 23, 2012, http://www.marines.mil/News/Messages/MessagesDisplay/tabid/13286/Article/109426/assignment-of-women-to-ground-combat-units.aspx.

12 Month Data Set		24 Month Data Set		36 Month Data Set	
Male	Fem	Male	Fem	Male	Fem
39,529	1,776	35,286	1,547	29,087	1,339
95.7%	4.3%	95.8%	4.2%	95.6%	4.4%

Table 4. Gender Composition of the 12- to 36-Month Data Sets

48 Month Data Set		60 Month Data Set		72 Month Data Set	
Male	Fem	Male	Fem	Male	Fem
28,467	1,342	20,606	881	15,265	650
95.5%	4.5%	95.9%	4.1%	95.9%	4.1%

Table 5. Gender Composition of the 48- to 72-Month Data Sets

c. Race

We create dummy variables *black, asian,* and *other* for racial classification to examine the additional demographic effect that race can potentially have on continuation characteristics of marine reservists. Previous studies utilizing ethnicity as descriptive variables have produced a mix of both statistically significant and insignificant results on continuation behavior among Marine reservists.[33] Race is left out of the models, however, as more than 25,000 observations contain missing values or responses of "chose not to answer" for race identifiers. Descriptive statistics for this aspect of the data set are presented in Figure 3.

[33] Phillip R. Herschelman, "United States Marine Corps Reserve First Term Attrition Characteristics" (master's thesis, Naval Postgraduate School, 2012), 56.

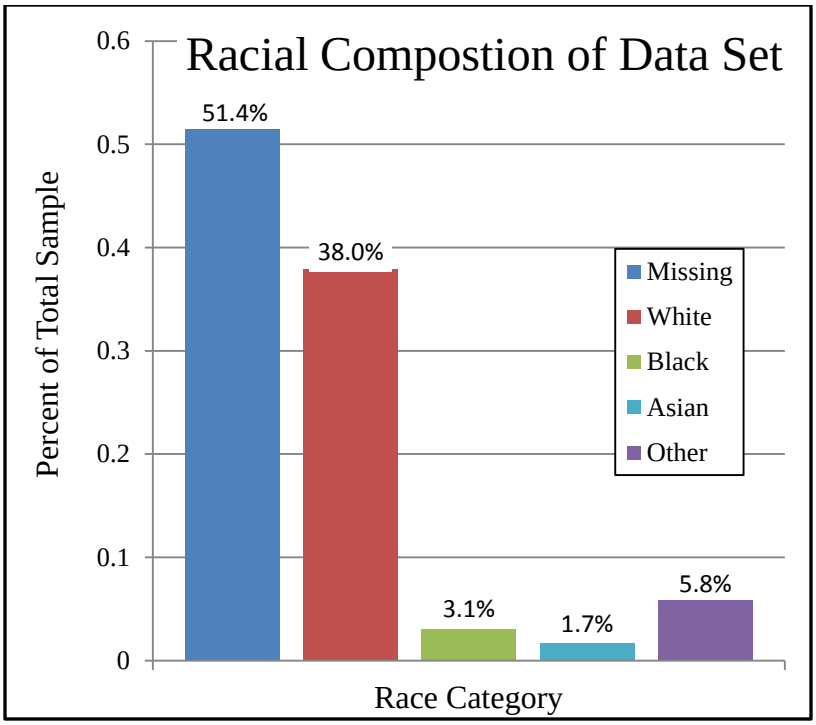

Figure 3. Racial Composition of the Data Set

2. Constructed Variables

a. Incremental Active Duty Training Indicator

The binary variable *split*_i is the primary variable of interest in this study, as it identifies those individuals in the IIADT program. Individuals participating in the IIADT program are identified via their respective Program Enlisted for (PEF) code from the TFDW data. Those individuals affiliated with the IIADT are assigned the binary value 1, 0 is assigned otherwise. In total, there are 3,001 IIADT participants included in the sample although the count declines as the time horizon examined moves further. All told, the percentage of IIADT participants in the sample ranges from 4.5 percent to 6.6 percent (Table 6).

	12 Month Data Set	24 Month Data Set	36 Month Data Set	48 Month Data Set	60 Month Data Set	72 Month Data Set
Split_I	2,581	2,422	2,034	1,589	1,187	713
Non Split_I	38,724	34,411	28,392	23,429	20,300	15,205

Table 6. IIADT Participation Breakdown by Data Set

b. Education Level

We add dummy variables to identify the education level of SMCR participants at entry to identify any effect of education level on differences in Marine reservist continuation behavior. We include education level to differentiate between the starting point in the IIADT and any potential effects this has on continuation behavior. We do this because the IIADT program is available to individuals already attending college just as it is to recent high school graduates.[34] As such, we use binary variables for high school graduate or equivalent,[35] one year of college completed, and two or more years of college completed (*ed_level_12*, *ed_level_13*, and *ed_level_14* respectively) are utilized to differentiate the different categories within the model. For each variable, a value of 1 denotes an individual who falls in that educational category, 0 denotes otherwise. Summary statistics of education level for each data set are included in Table 7. Interestingly, relative percentages remain highly stable across the different data sets, as each categorical education level remains within a range of 0.2 to 0.3 percentage points.

[34] United States Marine Corps, "Marine Corps Order 1001R.54E: Marine Corps Reserve Incremental Initial Active Duty Training (IIADT) Program" May 3, 1999, 2, http://community.marines.mil/news/publications/Documents/MCO%201001R.54E.pdf.

[35] Individuals completing a high school equivalency program are authorized by MCO P1100.72c to enlist in the United States Marine Corps, although their overall enlistment numbers are minimized.

	12 Month Data Set	24 Month Data Set	36 Month Data Set	48 Month Data Set	60 Month Data Set	72 Month Data Set
Ed Level 12	93.7%	93.8%	93.9%	94.0%	94.0%	93.8%
Ed Level 13	2.4%	2.3%	2.3%	2.2%	2.2%	2.2%
Ed Level 14	3.9%	3.9%	3.8%	3.8%	3.8%	4.0%

Table 7. Education Level Composition Across Data Sets

c. Marital Status

We include the dummy variable *single* to capture any effects of being married on differences in continuation behavior among Marine reservists. Lizarraga finds a statistically significant effect of marital status on reservist continuation behavior in his 2011 thesis.[36] Additionally, previous studies such as Lizarraga's have included variables for identifying whether or not a particular individual is divorced. This study includes divorced individuals in the single category, as any underlying reasons that may have led to a previous marriage being dissolved are varied, untraceable, and include the attitudes and behaviors of an additional and completely unobserved individual. As such, individuals who are divorced or have had a marriage annulled are grouped together with other un-married individuals as single.

d. Dependents

The effect of dependents on reservist continuation behavior is captured in this study by a dummy variable, *gt1_dependent*. *gt1_dependent* takes on a value of 1 for the individual if they have more than on dependent noted in their record. As Lizarraga[37] and Herschelman[38] both find that having at least one dependent is correlated with improved

[36] Joseph M. Lizarraga, "Patterns of Marine Corps Reserve Continuation Behavior: Pre- and Post-9/11" (master's thesis, Naval Postgraduate School, 2011) 133.

[37] Ibid.

[38] Philip R. Herschelman, "United States Marine Corps Reserve First Term Attrition Characteristics" (master's thesis, Naval Postgraduate School, 2012) 50.

continuation behavior. Since we already have a variable that captures marriage, we assign this variable to capture the relationship with additional dependents.

e. Geographic Region

In accordance with the Census Bureau's division of the United States into nine distinct regions (Figure 4), SMCR accessions are assigned to regions of the United States based on the state in which they enlisted. Each of the nine regions is assigned a binary variable to capture regional differences such as taste for the military, regional subculture, localized unemployment, and the resulting effects on continuation behavior. Although previous studies (Herschelman & Lizarraga) have produced mixed results of regional effects with respect to statistical significance, this study includes regional dummies as a means of identifying differences among the population of reservists. Relative percentage of SMCR accessions, subdivided by region and data set are included in Table 8.

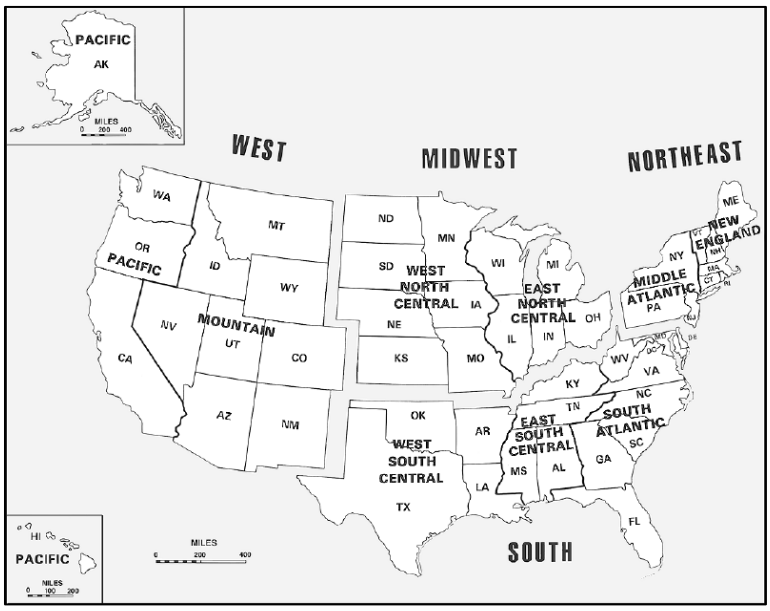

Figure 4. U.S. Census Bureau Regions[39]

[39] United States Census Bureau, *Geographic Areas Reference Manual*, 1994, accessed January 24, 2014, https://www.census.gov/geo/reference/pdfs/GARM/Ch6GARM.pdf

	12 Month Data Set	24 Month Data Set	36 Month Data Set	48 Month Data Set	60 Month Data Set	72 Month Data Set
Midwest East	5.2%	5.4%	5.5%	5.5%	5.6%	5.5%
Midwest West	14.2%	14.8%	14.7%	14.6%	14.7%	14.7%
New England	5.1%	5.4%	5.3%	5.3%	5.4%	5.4%
Mid Atlantic	12.8%	13.5%	13.5%	13.4%	13.5%	13.5%
South Atlantic	21.6%	19.1%	19.0%	19.0%	18.8%	18.6%
Southeast Central	5.5%	5.8%	5.9%	6.0%	5.8%	5.7%
Southwest Central	12.6%	13.1%	13.1%	13.1%	12.9%	13.1%
West Mountain	5.8%	6.0%	5.9%	5.9%	5.8%	5.6%
West Pacific	17.1%	17.0%	17.1%	17.1%	17.5%	17.9%

Table 8. Relative Percentage of SMCR NPS Accessions by Region and Data Set

f. AFQT Category

We add dummy variables for AFQT Categories I, II, IIIA, IIIB, and IV in the model as a means of controlling for aptitude (*afqt_i, afqt_ii*, *afqt_iiia*, *afqt_iiib*, and *afqt_iv* respectively). Although not specifically measureable, individual ability and drive are important to a model predicting continuation. AFQT score, however, is measureable and is regularly used as a proxy for ability. Each category is established as a binary variable, based on the guidelines in DOD Directive 1145.1.[40] Per the guidelines set forth in DOD Directive 1145.1, AFQT categories are aligned such that categories IIIA, II, and I are above the fiftieth percentile. However, as presented in Figure 5, 75.8 percent of the SMCR Marines in the data set are above the nationally normalized fiftieth percentile.

[40] Department of Defense, *Department of Defense Directive 1145.1: Quality Distribution of Military Manpower*, last modified November 21, 2003, 2, http://biotech.law.lsu.edu/blaw/dodd/corres/pdf2/d11451p.pdf.

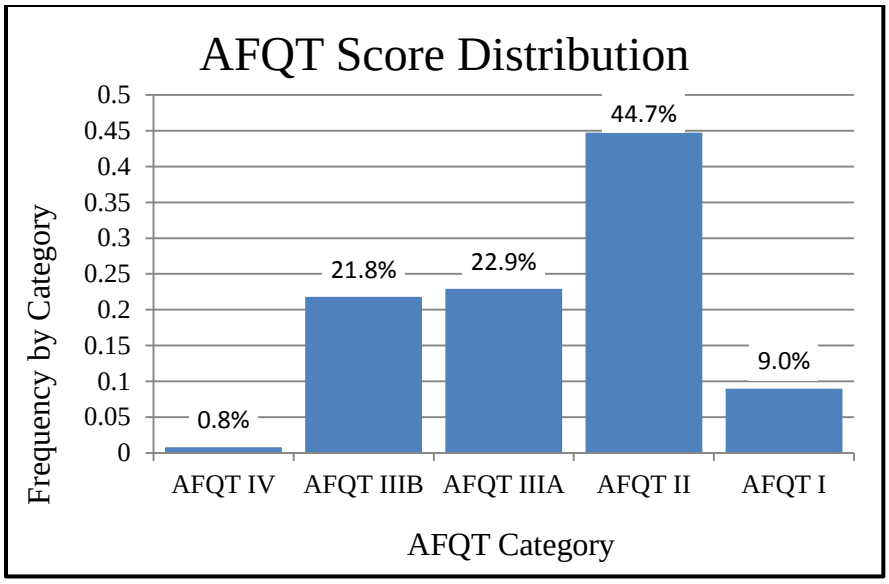

Figure 5. AFQT Score Distribution by Category

g. Occupational Specialty

As Herschelman[41] and Lizarraga[42] contend, military occupational specialty (MOS) or type of unit an individual Marine is assigned to, has a significant effect on continuation behavior in the SMCR. Job specialty, particularly person-job fit, can have significant effects on an individual's satisfaction, engagement, and dedication to the service. With the vast number of MOSs and the small number open to IIADT accessions, it is necessary to group MOS based upon the associated job type. As such, MOSs are broken into three categories with binary dummy variables assigned to each. MOS categories are identified as combat arms (infantry, tankers, and artillery), support MOSs (administration, logistics, communication, etc.), and Aviation MOSs (aircraft mechanics, aviation supply, air traffic control, etc.); *cbt_arms*, *suppt_mos*, and *avn_mos* respectively, similar to Herschelman's 2012 thesis. Table 9 presents the relative percentage of individual Marines in each category, averaged across the different data sets as the relative percentages vary by less than one percentage point each.

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[41] Philip R. Herschelman, "United States Marine Corps Reserve First Term Attrition Characteristics" (master's thesis, Naval Postgraduate School, 2012), 46.

[42] Joseph M. Lizarraga, "Patterns of Marine Corps Reserve Continuation Behavior: Pre- and Post-9/11" (master's thesis, Naval Postgraduate School, 2011), 123.

Combat Arms	Support MOS	Aviation MOS
33.4%	60.3%	6.3%

Table 9. MOS Category Relative Percentages

h. Performance Indicators

(1) First Class Physical Fitness Test. The Marine Corps' Physical Fitness Test (PFT) is a semi-annual evaluation of an individual's fitness. Moreover, it is a means of evaluating individual dedication to the lifestyle associated with being a Marine. Since the guidelines set forth to achieve the highest PFT classification are somewhat stringent, *pft_1* (1st Class PFT) is included as a dummy variable in order to differentiate between levels of dedication to the Marine Corps lifestyle among marine reservists, based on PFT Class code. The data received from TFDW are riddled with inconsistencies for PFT Class code, so individuals who are positively identified as having a first class PFT score code are assigned a categorical value of 1. All other values not positively identified as first class are assigned the categorical value of 0. The relative percentage of each data set positively identified as having a first class PFT are included in Table 10.

12 Month Data Set	24 Month Data Set	36 Month Data Set	48 Month Data Set	60 Month Data Set	72 Month Data Set
52.1%	51.6%	48.5%	43.9%	45.6%	42.5%

Table 10. Percentage of 1st Class PFT Scores by Data Set

(2) Proficiency and Conduct Marks. Proficiency and Conduct marks (pros/cons) are assigned to individuals E-4 and below, primarily on a semi-annual basis. Pros/cons can be useful in associating trends in behavior as they are assigned on regular intervals and are quite responsive to changes in an individual's performance, attitude, etc. Pros/cons data are compiled, and included in TFDW data as average marks in grade. Pros/cons are included in the individual Marine's composite score for promotion and, as such, are subject to guidelines included in Marine Corps Order P1070.12K to minimize

subjectivity. They are useful in the model as measures of individual performance.[43] Included as separate variables, *avg_pros* and *avg_cons* typically have an assigned range of 0.0/0.0 to 5.0/5.0, and vary across Marines of a pay grade. Due to the nature of assignment, *avg_pros* and *avg_cons* are each included in this model as continuous variables. Prior to inclusion as descriptive variables, the native variables describing average pros/cons in grade are multiplied by 10 in order to facilitate interpretation of the coefficient estimates and odds ratios. (Tables 11 and 12)

12 Month Data Set		24 Month Data Set		36 Month Data Set	
avg_pros	*avg_cons*	*avg_pros*	*avg_cons*	*avg_pros*	*avg_cons*
43.11	43.09	43.12	43.11	43.19	43.17

Table 11. Average Pros/Cons in the 12 to 36 Month Data Sets

48 Month Data Set		60 Month Data Set		72 Month Data Set	
avg_pros	*avg_cons*	*avg_pros*	*avg_cons*	*avg_pros*	*avg_cons*
43.37	43.34	43.62	43.59	43.85	43.79

Table 12. Average Pros/Cons in the 48 to 72 Month Data Sets

The data received have more than 7,600 values of zero assigned to individuals for either average proficiency or average conduct markings in grade. We consider these as null or missing, due to the unlikelihood that such values are administratively appropriate.

i. FY Cohorts

We include dummy variables identifying each of Marines by FY of their respective PEBD. We create the dummies to identify potential differences based on year effects across the cohorts. More specifically, we want to observe if there are any changes in

[43] United States Marine Corps, *Marine Corps Order P1070.12K w/CH 1: Marine Corps Individual Records Administration Manual (Short Title: IRAM)*, July 14, 2000, 4-41, http://www.marines.mil/Portals/59/Publications/MCO%20P1070.12K%20W%20CH%201.pdf.

continuation trends over time. Each FY is established as a binary variable with a value of 1 assigned if the individual is an accession of the associated FY, and 0 is assigned otherwise.

F. DATA LIMITATIONS

The TFDW data are riddled with missing values and inconsistencies. As such, many observations are automatically dropped from the data set by the different analysis software suites (STATA 11.0 and JMP Pro 10), thus losing any effects that potentially could have been levied against the resultant dependent variable. Other variables are intentionally not included. Race, for one, is a variable that has more than 27,000 instances of either missing values, or individuals who chose to not respond causing it to not be used as a descriptive variable in any model. Additionally, information on pre-enlistment waivers is incomplete, and thus excluded from the model. With these and other restraints on the data set, the predictive ability of the models is reduced, and the variable of primary interest, *split_i*, potentially absorbs some of the effect of these missing variables.

G. MULTIVARIATE FRAMEWORK

1. Logistic Regression

We employ logistic regression in this study because continuation is binary; either an individual continues in the service, or they do not. The logistic regression model predicts the probability that our dependent variable, *survive*, will equal 1 (the individual continues in the service) based on the gathered descriptive variables. In a more theoretical sense, with *i* explanatory variables, we can determine a probability of success in our dependent variable with *i* different marginal effects. Ultimately, the theoretical formula is similar to the following:

$$f(X) = \frac{e^{\beta_0+\beta_1 x}}{1+e^{\beta_0+\beta_1 x}} \qquad \text{Eqn (1)}$$

2. Model Description

The theoretical model used as the basis of this study, is that continuation behavior is determined among members of the military based upon a long and varied list of

determinates. Specifically, we are interested in examining the effects of IIADT participation, demographics, geographic region, aptitude, military job category, military performance, and year of entry into service.

We control for all of the demographic, geographical, aptitude, MOS, performance, and FY effects in order to isolate the effect of IIADT affiliation

$$P(continue = 1 \mid X) = f(\beta_0 + \beta(\text{IIADT}) + \beta(\text{Demographics}) + \beta(\text{Geographic Region}) + \beta(\text{Aptitude}) + \beta(\text{Occupational Specialty}) + \beta(\text{Military Performance}) + \beta(\text{FY})) \quad \text{Eqn (2)}$$

H. DESCRIPTIVE STATISTICS

Descriptive and summary statistics for the sample population are included in Table 13. Additionally, summary statistics were calculated for both subpopulations of the SMCR that are relevant to this study: IIADT accessions and single increment SMCR accessions. All statistics are included in Table 13, with the different populations identified with the appropriate column headings to identify the Full Sample, IIADT Accessions, and Non-IIADT Accessions.

	(1) IIADT		(2) Non-IIADT		(3) Full Sample	
Variable	**Obs**	**Mean**	**Obs**	**Mean**	**Obs**	**Mean**
Dependent						
Survive_12	2,581	0.993	38,724	0.985	41,305	0.986
Survive_24	2,422	0.965	34,411	0.968	36,833	0.967
Survive_36	2,034	0.926	28,392	0.934	30,426	0.934
Survive_48	1,589	0.931	23,429	0.922	25,018	0.922
Survive_60	1,187	0.902	20,300	0.907	21.487	0.907
Survive_72	713	0.905	15,205	0.897	15,918	0.898
Explanatory						
Split_I	2,581	-	38,724	-	41,305	0.062
Male	2,581	0.955	38,724	0.960	41,305	0.959
Ed_level_12	2,581	0.881	38,724	0.938	41,305	0.934
Ed_level_13	2,581	0.055	38,724	0.022	41,305	0.024
Ed_level_14	2,581	0.064	38,724	0.040	41,305	0.041
Single	2,581	0.841	38,724	0.769	41,305	0.773
Gt1_dependents	2,581	0.129	38,724	0.215	41,305	0.209
MW_West	2,581	0.055	38,724	0.054	41,305	0.054
MW_East	2,581	0.176	38,724	0.144	41,305	0.146
New_Eng	2,581	0.064	38,724	0.052	41,305	0.053
Mid_Atl	2,581	0.119	38,724	0.134	41,305	0.133
Sou_Atl	2,581	0.244	38,724	0.194	41,305	0.197
Sou_East_Cent	2,581	0.096	38,724	0.053	41,305	0.056
Sou_West_Cent	2,581	0.084	38,724	0.133	41,305	0.130
West_Mtn	2,581	0.039	38,724	0.061	41,305	0.060
West_Pac	2,581	0.124	38,724	0.176	41,305	0.172
AFQT_I	2,581	0.209	38,721	0.082	41,302	0.090
AFQT_II	2,581	0.589	38,721	0.437	41,302	0.447
AFQT_IIIa	2,581	0.133	38,721	0.236	41,302	0.229
AFQT_IIIb	2,581	0.063	38,721	0.229	41,302	0.218
AFQT_IV	2,581	0.001	38,721	0.008	41,302	0.008
Avg AFQT Score	2,581	77.743	38,724	64.740	41,302	65.553
Cbt_Arms	2,581	0.382	38,724	0.331	41,305	0.334
Suppt_MOS	2,581	0.604	38,724	0.603	41,305	0.603
Avn_MOS	2,581	0.014	38,724	0.066	41,305	0.063
First_Class_PFT	2,581	0.701	38,724	0.552	41,305	0.562
Avg_Pros	2,154	43.606	32,644	43.080	34,798	43.113
Avg_Cons	2,154	43.668	32,644	43.047	34,798	43.085

Table 13. Descriptive Statistics for the Full Sample and Both Subpopulations of Non-Prior Service SMCR Accessions (FY 2002–2011).

Per the descriptive statistics included in Table 13, the statement from MCO 1001R.54E that "The IIADT Program was established to attract highly qualified NPS applicants for enlistment in the Marine Corps Reserve" appears to be true of our sample, at least in a superficial examination.[44] For example, AFQT score is a commonly used measurement of quality among military accessions. The average AFQT score for IIADT Marines is 13.0 percentage points higher (77.7 versus 64.7). Additionally, 79.8 percent of IIADT affiliates received AFQT scores in category I or II, compared to 51.9 percent of non-IIADT affiliates in the SMCR. Moreover, a higher relative percentage of IIADT affiliates received first class scores on their PFT than non-IIADT affiliates (70.1 percent compared to 55.2 percent). Lastly, another means of attempting to identify differences in quality is by comparing proficiency and conduct marks. As such, with scaling the average pros/cons of IIADT affiliates are 43.61/43.67 respectively, whereas those of non-IIADT affiliates are 43.08/43.05 respectively. Although we are only examining these statistics in a superficial manner here, further investigation could potentially reveal significance in the identified differences.

I. SUMMARY

This chapter identifies and describes the dependent and independent variables used in this study. The dependent variables (*survive_12*, *survive_24*, *survive_36*, *survive_48*, *survive_60*, *survive_72*) identify the continued affiliation status of an individual with the SMCR at 12 month intervals. Descriptive variables include:

- IIADT affiliation
- demographics (gender, education level, marital status, dependents)
- geographic region (in accordance with the U.S. Census Bureau)
- aptitude by AFQT category
- MOS category (combat arms, support, aviation)
- military performance indicators (proficiency marks, conduct marks, PFT class)
- FY cohort (2002–2011)

[44] United States Marine Corps, "Marine Corps Order 1001R.54E: Marine Corps Reserve Incremental Initial Active Duty Training (IIADT) Program," last modified May 3, 1999, 2.

We are better able to control for existing population differences by including and controlling for the above listed variables, and better identify the effect (if any) of the treatment and its effect on continuation in the SMCR.

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IV. MODEL SPECIFICATION AND ANALYSIS

Preliminary analysis and other attempts to answer the primary research question of this thesis based on summary statistics have little, if any, power at all. This chapter outlines the process of identifying and validating candidate models for each particular milestone. In addition, this chapter presents the results of the models and discusses additional trends across the data.

A. VARIABLE SELECTION AND MODEL SPECIFICATION

This section discusses the process of specifying potential multivariate models for each milestone and then details the model validation. Ultimately, all models specified for this thesis are a variation of the multivariate equation displayed in Equation 2.

$$P(continue = 1 \mid X) = f(\beta_0 + \beta(\text{IIADT}) + \beta(\text{Demographics}) + \beta(\text{Geographic Region}) + \beta(\text{Aptitude}) + \beta(\text{Occupational Specialty}) + \beta(\text{Military Performance}) + \beta(\text{FY})) \quad \text{Eqn (2)}$$

1. Univariate Logistic Regression

As Hosmer and Lemeshow recommend, an appropriate method for determining variables for inclusion into a model begins with a univariate analysis of the effect of each candidate descriptive variable on the response variable.[45] We select all covariates with p-value less than 0.25 for consideration for inclusion in the step-wise regression model.

2. Stepwise Logistic Regression

After analyzing each variable on an individual basis, we use the stepwise logistic regression feature of JMP Pro 10 to recommend variables for inclusion into our candidate models, with minimum Akaike's information criterion (AIC)[46] as the stopping criterion. Subsequently, if not recommended for inclusion, we insert the indicator variable for

[45] David W. Hosmer, and Stanley Lemeshow, *Applied Logistic Regression*, 2nd ed. (Hoboken, NJ: John Wiley & Sons, 2000), 28.

[46] Akaike's information criterion (AIC) is a measure of the tradeoff between goodness of fit of a model and the model's complexity. Although not a measure of accuracy of a model, it does provide a measure for comparing candidate models for explaining a particular dataset.

Incremental Initial Active Duty Training (IIADT) affiliation, *split_i*, into the model, and again fit the ordinal logistic regression for an initial look at candidate model performance.

The next effort in specifying the models is inclusion of interaction terms. We manually interact the indicator variable with each additional main effect variable in the pool of candidates to identify additional effects of IIADT affiliation. Again, we use the stepwise logistic regression function of JMP to evaluate the effects of including the interacted variables.

3. STATA Verification and Estimation

In addition to the variable list identified by the stepwise procedure, we include additional interaction variables into the candidate models as a means to attempt more accurate prediction of the response variable. Additional variables selected for interaction with the treatment indicator are then included in the candidate model and again evaluated. We then evaluate the overall model for changes in significance as well as check the statistical significance of the newly included interaction variable. Additional interacted variables are only maintained in the model if they met three criteria:

- Inclusion of the added variable did not adversely affect the overall significance of the model
- Inclusion of the added variable did not affect the significance level of *split_i*, such as changing the significance of *split_i* from 0.01 to 0.05 or to 0.10, etc.
- The *p-value* for the coefficient estimate of the added variable is 0.10 or smaller.

B. MODELS, RESULTS, AND ANALYSES

This section presents and discusses each model individually as each model of the six models individually. We follow the same general process for each model.

1. 12-Month Model

a. Model Specification

The data set for the 12-month model is the largest with 41,305 eligible observations. We include the variables avg_pros and avg_cons in the model, which

causes 6,507 observations to be excluded because sergeants and staff sergeants do not receive proficiency and conduct marks.[47] The list of included parameters and estimates is shown in Figure 6.

Logistic regression — Number of obs = 34798; LR chi2(30) = 1136.12; Prob > chi2 = 0.0000; Log likelihood = −2287.5142; Pseudo R2 = 0.1989

survive_12	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
split_i	−1.166592	1.677177	−0.70	0.487	−4.453799	2.120615
male	.3515012	.1764108	1.99	0.046	.0057423	.6972601
single	−.5900828	.2032168	−2.90	0.004	−.9883803	−.1917853
gt1_depend~s	.6947015	.2411032	2.88	0.004	.2221478	1.167255
ed_level_12	.354828	.3040143	1.17	0.243	−.2410292	.9506851
ed_level_14	−.8169967	.3382259	−2.42	0.016	−1.479907	−.1540862
mw_west	−.6203365	.2352013	−2.64	0.008	−1.081323	−.1593504
mw_east	.0507942	.2147937	0.24	0.813	−.3701938	.4717822
new_eng	.6478576	.3754262	1.73	0.084	−.0879641	1.383679
mid_atl	.6899234	.2621895	2.63	0.009	.1760414	1.203805
sou_atl	−1.443841	.1571497	−9.19	0.000	−1.751848	−1.135833
west_mtn	−.0753285	.2679549	−0.28	0.779	−.6005105	.4498535
west_pac	−.5220883	.1784254	−2.93	0.003	−.8717956	−.1723809
afqt_iiib	−.220171	.1018457	−2.16	0.031	−.4197849	−.020557
suppt_mos	−.7297294	.1143351	−6.38	0.000	−.9538221	−.5056366
frst_cla~pft	1.92499	.122478	15.72	0.000	1.684938	2.165043
avg_pros	−.1270336	.0161476	−7.87	0.000	−.1586822	−.095385
avg_cons	.1568939	.0127248	12.33	0.000	.1319538	.181834
fy_03	.3296299	.2549254	1.29	0.196	−.1700147	.8292745
fy_04	−.9567172	.1989956	−4.81	0.000	−1.346741	−.566693
fy_05	−1.075521	.199875	−5.38	0.000	−1.467269	−.6837734
fy_06	−1.413611	.1922384	−7.35	0.000	−1.790391	−1.03683
fy_07	−1.236828	.2028634	−6.10	0.000	−1.634433	−.8392233
fy_08	−1.261043	.2214419	−5.69	0.000	−1.695062	−.8270252
fy_09	−1.096617	.2196574	−4.99	0.000	−1.527138	−.6660963
fy_10	−1.292768	.2082618	−6.21	0.000	−1.700953	−.884582
split_mwe	−1.009561	.6710224	−1.50	0.132	−2.32474	.3056193
split_midatl	−1.073646	1.069264	−1.00	0.315	−3.169364	1.022073
split_cons	.0499107	.0399889	1.25	0.212	−.028466	.1282874
split_09	.5141687	1.054549	0.49	0.626	−1.55271	2.581047
_cons	4.091361	.6035693	6.78	0.000	2.908387	5.274335

Figure 6. Parameter Estimates for the 12-Month Model

b. Model Diagnostics

(1) Whole Model Test. As shown in Figure 7, the specified model is a better fit to the data than the intercept-only model because *p-value* for the whole model test is 0.0001. The pseudo R^2 for the 12-month model is 0.1989, indicating that 19.89 percent of

[47] United States Marine Corps, *Marine Corps Order P1070.12K w/CH 1: Marine Corps Individual Records Administration Manual (Short Title: IRAM)*, 2000, 4-34, http://www.marines.mil/Portals/59/Publications/MCO%20P1070.12K%20W%20CH%201.pdf.

variability in achieving the 12-month milestone is explained by the model. Lastly, the 12-month model is estimated to be 83.61 percent efficient at correctly classifying continuation probability, as evidenced by the ROC curve Figure 7.

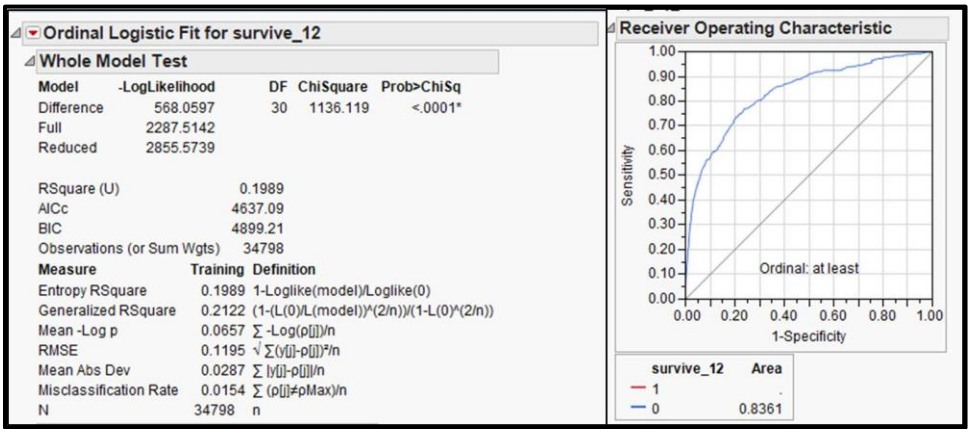

Figure 7. 12-Month Model Diagnostics

(2) Cross Validation. The whole model diagnostics indicate that the 12-month model achieves a misclassification rate of only 0.0154 (Figure 7). Cross validation confirms this performance.

We randomly select a test set of approximately 20 percent of the data. We refit the model to the training set then classify the members of the test set according to the model's prediction equation. Cross validation of the 12-month model, using a test set of 6,955 randomly selected observations indicates that the model achieves a misclassification rate of 0.0145 (Figure 8).

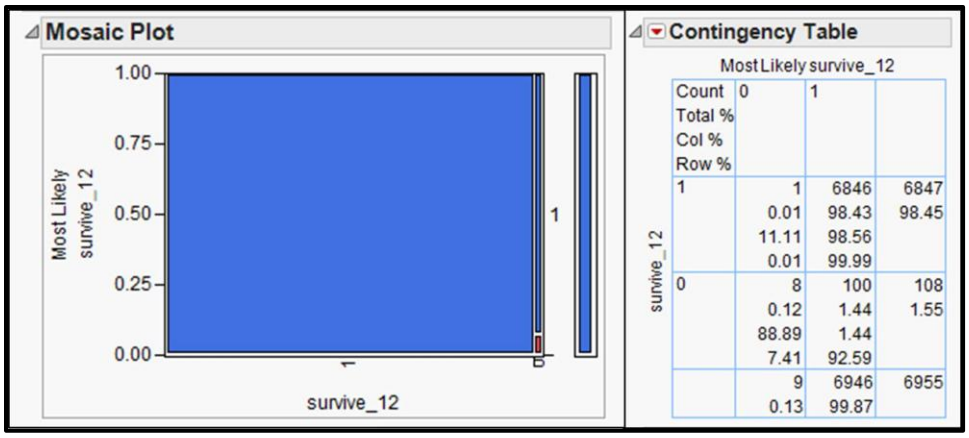

Figure 8. 12-Month Model Cross validation Mosaic Plot

c. Results Analysis

The key finding of the 12-month model is that IIADT Marines are statistically no different than non-IIADT Marines in achieving the 12 month milestone (Table 14). Specifically, the coefficient estimate and subsequent odds ratio of *split_i* are -1.167, and 0.311 respectively (*p-value*=0.487 > 0.05).

12 Month Model	Estimate	Odds Ratio	Interpretation
split_i	-1.167	0.311	Individuals associated with the IIADT program are no different in their likelihood of reaching the 12 month continuation milestone.
*****p<0.01, **p<0.05, *p<0.10**			

Table 14. 12-Month Model Coefficient Estimate and Odds Ratio for *split_i*

We examine the coefficients for FY covariates to determine if the subsequent cohorts behave differently with respect to achieving this milestone. Table 15 includes the odds ratios of each FY from the 12-month model. There exists almost no noticeable trend of decline in the odds ratios of continuation to 12 months. However, there exists the trend that all odds ratios from *fy-04* through *fy_10* are below 0.05 as we examine the table from left to right. Note: All odds ratios are with respect to FY02.

fy_03	*fy_04*	*fy_05*	*fy_06*	*fy_07*	*fy_08*	*fy_09*	*fy_10*
1.390	0.384 ***	0.341 ***	0.243 ***	0.290 ***	0.283 ***	0.334 ***	0.275 ***
*****p<0.01, **p<0.05, *p<0.10**							

Table 15. Fiscal Year Odds Ratios for the 12-Month Model

2. 24-Month Model

a. Model Specification

The data set for the 24-month model contains the second largest number of observations with 36,833, although the same restriction applies here as does with the 12-month model. We include *avg_pros* and *avg_cons*, which causes 6,478 observations to be excluded. The list of included covariates, and the respective parameter estimates are included in Figure 9.

Logistic regression — Number of obs = 30355; LR chi2(31) = 1246.62; Prob > chi2 = 0.0000; Log likelihood = −4419.8451; Pseudo R2 = 0.1236

survive_24	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
split_i	−.7911278	.2891053	−2.74	0.006	−1.357764	−.2244918
male	.2760229	.1425876	1.94	0.053	−.0034437	.5554896
single	−.1249567	.1283441	−0.97	0.330	−.3765064	.1265931
gt1_depend~s	1.303053	.169372	7.69	0.000	.9710898	1.635016
ed_level_13	−.1036602	.2091899	−0.50	0.620	−.5136649	.3063445
mw_west	−.0406833	.1588535	−0.26	0.798	−.3520305	.2706639
mw_east	−.0896907	.1094622	−0.82	0.413	−.3042326	.1248513
new_eng	−.3442552	.1416897	−2.43	0.015	−.6219618	−.0665485
mid_atl	−.1650423	.1093954	−1.51	0.131	−.3794534	.0493689
sou_atl	−.1411807	.1022249	−1.38	0.167	−.3415377	.0591763
west_mtn	−.4726898	.1277356	−3.70	0.000	−.723047	−.2223326
west_pac	−.0131434	.1073331	−0.12	0.903	−.2235124	.1972255
afqt_i	−.237775	.1143016	−2.08	0.038	−.461802	−.0137479
afqt_ii	.0877464	.0771647	1.14	0.255	−.0634936	.2389863
afqt_iiia	.1886166	.0889557	2.12	0.034	.0142666	.3629666
afqt_iv	.2019747	.3249828	0.62	0.534	−.4349798	.8389292
cbt_arms	−.4167054	.1423076	−2.93	0.003	−.6956231	−.1377877
suppt_mos	−.1693287	.1369707	−1.24	0.216	−.4377863	.0991289
frst_cla~pft	1.949257	.0837949	23.26	0.000	1.785022	2.113491
avg_pros	−.0224723	.0138548	−1.62	0.105	−.0496273	.0046827
avg_cons	.0844143	.0133794	6.31	0.000	.0581911	.1106374
fy_02	1.692003	.1763349	9.60	0.000	1.346393	2.037613
fy_03	1.009784	.151094	6.68	0.000	.7136454	1.305923
fy_04	.4940858	.1433783	3.45	0.001	.2130695	.7751022
fy_05	.4440604	.1444233	3.07	0.002	.160996	.7271249
fy_06	.2228498	.1399405	1.59	0.111	−.0514286	.4971281
fy_07	.1827544	.1413564	1.29	0.196	−.094299	.4598078
fy_08	.1768552	.1508108	1.17	0.241	−.1187286	.472439
fy_09	.1462211	.1409686	1.04	0.300	−.1300724	.4225145
split_ed12	.7271194	.3030157	2.40	0.016	.1332196	1.321019
split_cbt	.2922453	.2517986	1.16	0.246	−.2012709	.7857616
_cons	−.5386988	.3500994	−1.54	0.124	−1.224881	.1474834

Figure 9. Parameter Estimates for the 24-Month Model

b. Model Diagnostics

(1) Whole Model Test. Figure 10 details the model test figures for the 24-month model. Of primary interest, Figure 10 indicates that the specified model is a better fit than the intercept only model, with a *p-value* 0.0001. In addition, the pseudo R^2 is 0.1236. The pseudo R^2 indicates that 12.36 percent of variability in attaining the 24 month milestone is explained by the specified model. Lastly, the 24-month model is estimated to be 78.49 percent efficient in predicting 24 month continuation, as evidenced by the ROC curve in Figure 10.

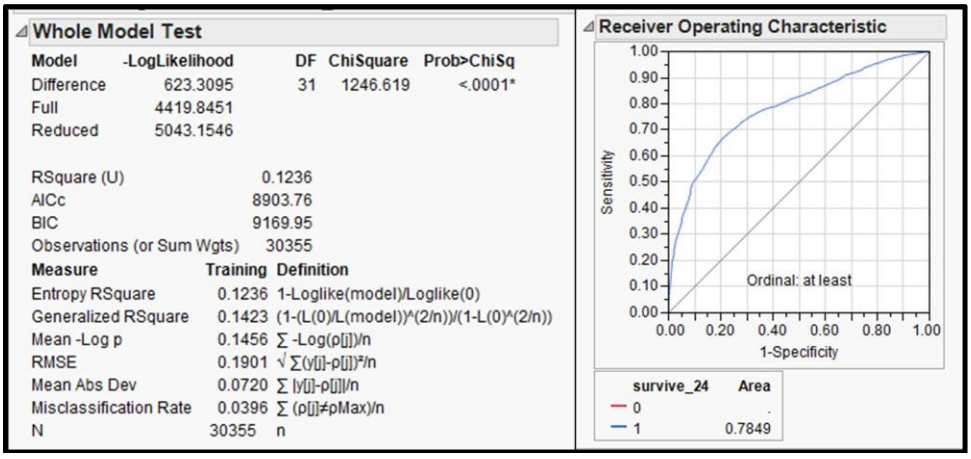

Figure 10. 24-Month Model Diagnostics

(2) Cross Validation. Although we notice a decrease in the explained variability, the whole model test statistics estimate that the 24-month model achieves a misclassification rate of 0.0396. (Figure 10) Cross validation confirms the estimated performance.

We randomly select a test set of approximately 20 percent of the data. We refit the model to the training set then classify the members of the test set according to the model's prediction equation. Cross validation of the 24-month model, using a test set of 6,055 observations, we validate the model to a misclassification rate of 0.0372 (Figure 11).

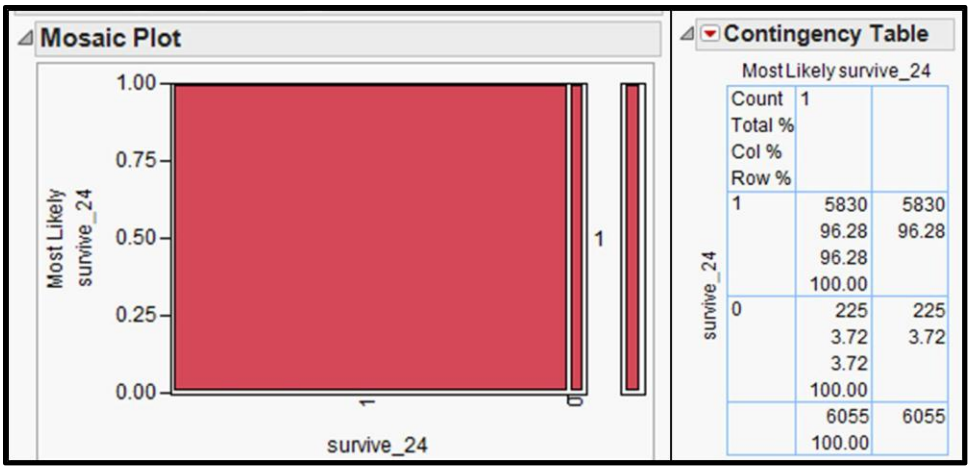

Figure 11. 24-Month Model Cross Validation Mosaic Plot

c. Results Analysis

The key finding of the 24-month model is that IIADT Marines are associated with lower rates of achieving the 24 month continuation milestone (Table 16). Specifically, the coefficient estimate and resultant odds ratio of the indicator variable, *split_i*, are -0.791 and 0.453 respectively (*p-value*=0.038). As such, affiliation with the IIADT program is associated with a statistically significant lower probability of reaching the 24 month milestone, given that the individual made it to 12 months. Another notable finding by the 24-month model is that the odds ratio for *afqt_i* is less than one, indicating a lower probability of reaching the 24-month milestone than NPS SMCR Marines who score in the category IIIB range on the AFQT. Note: AFQT category II, IIIa, and IV have odds ratios greater than one.

24 Month Model	Estimate	Odds Ratio	Interpretation
split_i	-0.791***	0.453***	Individuals associated with the IIADT program are less likely to achieve the 24 month continuation milestone.
afqt_i	-0.238 ***	0.788***	Individuals who score category I on the AFQT are less likely to achieve the 24 month continuation milestone than category IIIb Marines.
*****p<0.01, **p<0.05, *p<0.10**			

Table 16. 24-Month Model Coefficient Estimates and Odds Ratios for Selected Covariates

In addition to examining the effects of split_i, we also examine the coefficients of the included FY dummies to determine differences in continuation behavior with respect to FY. Table 17 includes the odds ratios of each FY included in the 24-month model, with respect to FY 2010. Similar to the trend present in the 12-month model, as we examine the odds ratios in Table 17 from left to right, there exists a declining trend from FY 02 to FY 05 that remains greater than 1.5 while statistically significant. From the included odds ratios, it appears that there is a decreasing trend in 24 month continuation rates. Of note, FY dummies lose significance after FY 2005, although FY 2006

fy_02	*fy_03*	*fy_04*	*fy_05*	*fy_06*	*fy_07*	*fy_08*	*fy_09*
5.430 ***	2.745 ***	1.639 ***	1.559 ***	1.250	1.201	1.193	1.157
*****p<0.01, **p<0.05, *p<0.10**							

Table 17. Fiscal Year Odds Ratios for the 24-Month Model

3. 36-Month Model

a. Model Specification

The 36-month model is specified in a manner similar to the 12- and 24-month models in that stepwise regression recommends many of the same variables for inclusion. Specifically, *avg_pros* and *avg_cons* are included, causing the number of included observations to drop from 30,426 eligible to 23,950. Ultimately, between main effect

variables and interacted variables, the model includes 29 descriptive variables, of which 16 are significant to the 95 percent level (*p-value*<0.05). Parameter estimates are included in Figure 12.

Logistic regression — Number of obs = 23950; LR chi2(29) = 1620.36; Prob > chi2 = 0.0000; Log likelihood = −6098.2341; Pseudo R2 = 0.1173

survive_36	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
split_i	−1.182967	.2368185	−5.00	0.000	−1.647123	−.7188115
male	.4271073	.1050294	4.07	0.000	.2212534	.6329611
single	.1835531	.0929318	1.98	0.048	.0014101	.3656961
gt1_depend~s	1.194575	.1100949	10.85	0.000	.9787927	1.410357
ed_level_13	.1477082	.1862063	0.79	0.428	−.2172495	.512666
ed_level_14	−.3712735	.1330481	−2.79	0.005	−.6320429	−.1105041
mw_east	.0218695	.1264616	0.17	0.863	−.2259907	.2697297
new_eng	−.0566559	.1499675	−0.38	0.706	−.3505868	.2372751
mid_atl	.0102804	.1265723	0.08	0.935	−.2377968	.2583575
sou_atl	−.0582863	.1208489	−0.48	0.630	−.2951458	.1785733
sou_east_c~t	−.0141793	.1477847	−0.10	0.924	−.303832	.2754734
sou_west_c~t	−.1120183	.1260904	−0.89	0.374	−.3591509	.1351142
west_mtn	−.2012369	.1428824	−1.41	0.159	−.4812812	.0788074
west_pac	.1518062	.1260143	1.20	0.228	−.0951773	.3987897
afqt_i	.2705504	.1046782	2.58	0.010	.065385	.4757158
afqt_ii	.1580532	.0625927	2.53	0.012	.0353738	.2807326
afqt_iiia	.1430489	.0700446	2.04	0.041	.005764	.2803337
afqt_iv	−.4183577	.2090449	−2.00	0.045	−.8280782	−.0086372
cbt_arms	−.1413022	.0544935	−2.59	0.010	−.2481076	−.0344969
avn_mos	.1425026	.1034923	1.38	0.169	−.0603385	.3453436
frst_cla~pft	1.634712	.0672372	24.31	0.000	1.502929	1.766494
avg_pros	.0223933	.0123881	1.81	0.071	−.0018869	.0466734
avg_cons	.0609168	.012512	4.87	0.000	.0363937	.0854398
fy_06	−.2561431	.0717659	−3.57	0.000	−.3968018	−.1154845
fy_07	−.1385813	.0782106	−1.77	0.076	−.2918713	.0147086
fy_08	−.326309	.0863991	−3.78	0.000	−.4956482	−.1569698
split_ed12	1.034986	.2537731	4.08	0.000	.5375998	1.532372
split_wpac	−.5487894	.2532035	−2.17	0.030	−1.045059	−.0525197
split_afqt3b	.3105829	.4262636	0.73	0.466	−.5248785	1.146044
_cons	−2.335371	.2587334	−9.03	0.000	−2.842479	−1.828263

Figure 12. Parameter Estimates for the 36-Month Model

b. Model Diagnostics

(1) Whole Model Test. As Figure 13 indicates, the model specified for 36 month continuation is a better fit than the intercept-only model (*p-value* 0.0001). Similar to the 24 month model, we see a further drop in pseudo R2, down from 0.1236 in the 24-month model, to 0.1173 for the 36-month model. As such, nearly 90 percent of variability in the response variable is left unexplained by the model. Lastly, the ROC curve suggests that the specified model is 76.02 percent efficient in predicting survival to 36 months, as indicated by Figure 13.

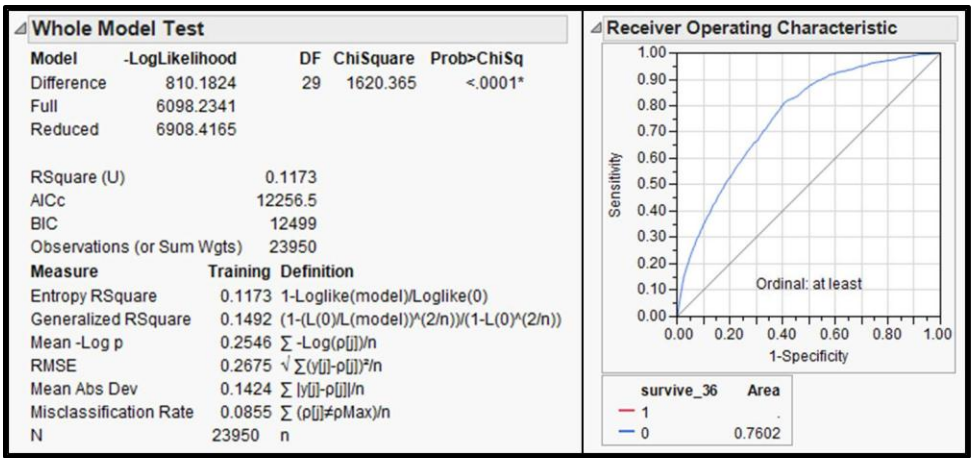

Figure 13. 36-Month Model Diagnostics

(2) Cross Validation. According to the whole model diagnostics, the 36-month model achieves to a misclassification rate of 0.0855 (Figure 13). Cross validation confirms this performance.

We randomly select a test set of approximately 20 percent of the data. We refit the model to the training set then classify the members of the test set according to the model's prediction equation. Cross validation of the 36-month model, using a test set of 4,891 randomly selected observations indicates that the model achieves a misclassification rate of 0.0844. (Figure 14)

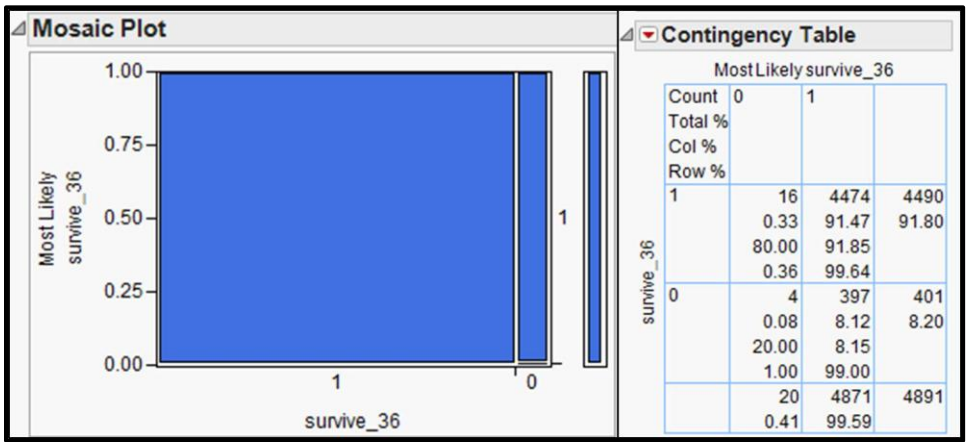

Figure 14. 36-Month Model Cross Validation Mosaic Plot

c. Results Analysis

The key finding by the 36-month model is that individuals associated with the IIADT program are associated with lower rates of achieving the 36 month milestone (Table 18). Specifically, the coefficient estimate and calculated odds ratio of the indicator variable, *split_i*, are -1.086 and 0.335 respectively (*p-value* 0.0001). As such, affiliation with the IIADT program remains associated with a statistically significant lower probability of reaching the 36 month milestone, given that the individual made it to 24 months. Of note, high school graduates (not higher) affiliated with the IIADT program have a statistically higher probability of attaining the 36 month milestone as evidenced by Table 18.

36 Month Model	Estimate	Odds Ratio	Interpretation
split_i	-1.183***	0.306***	Individuals associated with the IIADT program are less likely to achieve the 36 month continuation milestone.
split_ed12	1.034***	2.815***	HS graduates (not higher) affiliated with the IIADT are more likely to reach the 36 month milestone than other education categories or IIADT affiliation.
*****p<0.01, **p<0.05, *p<0.10**			

Table 18. 36-Month Model Coefficient Estimates and Odds Ratios for Selected Covariates

4. 48-Month Model

a. Model Specification

The data set for the 48-month model contains 25,018 observations, of which 6,464 (25.84 percent) are sergeants or higher, and will be dropped if the variables for pros and cons are used. Two models are developed initially for the 48 month data set, one that includes pros and cons, and one that does not. Comparing the two models, there is no change in significance level of the model, nor of the primary descriptive variable, nor any noticeable change in other main effect variables. Pros and cons are maintained in the

model, however, as the majority of the data set (74.16 percent) still receive pros and cons, and both *avg_pros* and *avg_cons* are significant (*p-value* 0.022 and 0.000 respectively).[48] Parameter estimates are included in Figure 15.

Logistic regression — Number of obs = 20323; LR chi2(27) = 3037.48; Prob > chi2 = 0.0000; Log likelihood = −8091.4369; Pseudo R2 = 0.1580

survive_48	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
split_i	−.3267203	.1157746	−2.82	0.005	−.5536345	−.0998062
male	.483331	.087244	5.54	0.000	.312336	.6543261
single	.3620894	.0760399	4.76	0.000	.2130539	.5111249
gt1_depend~s	1.25374	.0847278	14.80	0.000	1.087677	1.419804
ed_level_12	.1265447	.1519257	0.83	0.405	−.1712242	.4243137
ed_level_14	−.4097269	.1804958	−2.27	0.023	−.7634922	−.0559617
mid_atl	.0751467	.0603539	1.25	0.213	−.0431447	.1934381
sou_west_c~t	−.0559803	.0597561	−0.94	0.349	−.1731	.0611395
west_pac	.1573611	.0568771	2.77	0.006	.0458841	.2688382
afqt_ii	−.0370966	.0720914	−0.51	0.607	−.1783931	.1042
afqt_iiia	−.0334096	.0783281	−0.43	0.670	−.1869297	.1201106
afqt_iiib	−.2359164	.0787101	−3.00	0.003	−.3901855	−.0816474
afqt_iv	−.5118747	.2000534	−2.56	0.011	−.903972	−.1197773
cbt_arms	−.1963375	.0844202	−2.33	0.020	−.361798	−.0308769
suppt_mos	−.0748187	.0801318	−0.93	0.350	−.2318742	.0822367
frst_cla~pft	1.942601	.0577536	33.64	0.000	1.829406	2.055796
avg_pros	.0377017	.01152	3.27	0.001	.0151228	.0602805
avg_cons	.0653521	.0115748	5.65	0.000	.0426659	.0880382
fy_03	.2164232	.0643907	3.36	0.001	.0902198	.3426265
fy_04	−.0661227	.0657583	−1.01	0.315	−.1950067	.0627613
fy_05	−.3352674	.0663343	−5.05	0.000	−.4652802	−.2052547
fy_06	−.2991263	.0686377	−4.36	0.000	−.4336537	−.1645989
fy_07	−.2902575	.0702242	−4.13	0.000	−.4278945	−.1526205
split_ed13	−.9255639	.3395236	−2.73	0.006	−1.591018	−.2601098
split_afqt3b	.8729375	.4148332	2.10	0.035	.0598793	1.685996
split_cbt	.102405	.1708833	0.60	0.549	−.2325201	.4373301
split_06	.1989537	.2017877	0.99	0.324	−.1965428	.5944503
_cons	−4.187928	.2915233	−14.37	0.000	−4.759303	−3.616553

Figure 15. Parameter Estimates for the 48-Month Model

b. Model Diagnostics

(1) Whole Model Test. Figure 16 details the model test figures for the 48-month model as produced by JMP. Specifically, Figure 16 indicates that the model has better descriptive power over the data set than the restricted model containing only the intercept, as indicated by the *p-value* of 0.0001. The pseudo R^2 is similar to that of the 36-month model at 0.1150. Lastly, the 48-month model, as specified, is 75.08 percent efficient in predicting continuation to 48 months, as indicated in Figure 16.

[48] Ibid.

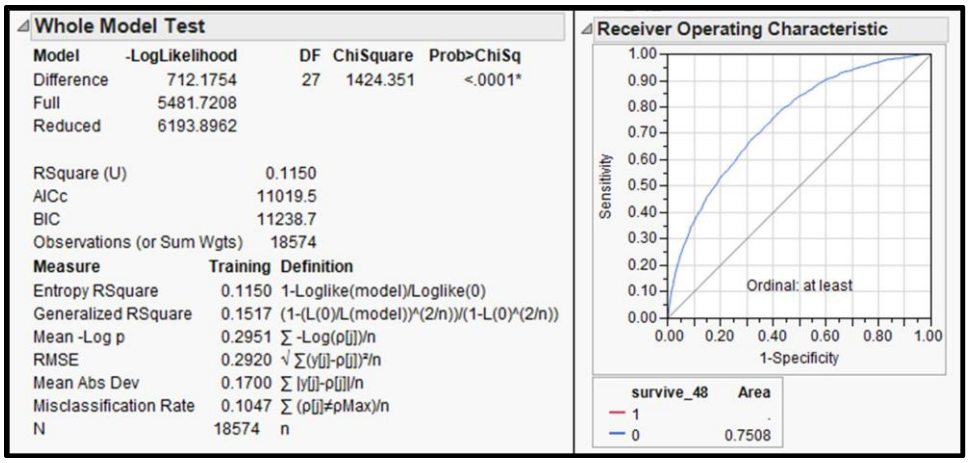

Figure 16. 48-Month Model Diagnostics

(2) Cross Validation. In accordance with the whole model diagnostics presented in Figure 16, JMP estimates that the 48-month model achieves a misclassification rate of 0.1047. Cross validation confirms the estimated performance.

We randomly select a test set of approximately 20 percent of the data. We refit the model to the training set then classify the members of the test set according to the model's prediction equation. Cross validation of the 48-month model, using a test set of 3,662 randomly selected observations indicates that the model produces a misclassification rate of 0.1016. (Figure 17)

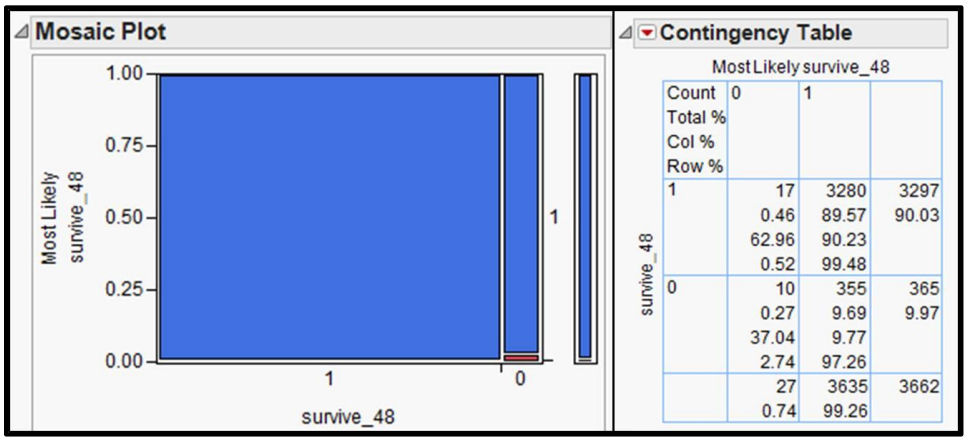

Figure 17. 48-Month Model Cross Validation

c. Results Analysis

The key result of the 48-month model is that IIADT Marines are statistically less likely to attain the 48 month milestone than those not affiliated with the IIADT (Table 19). The coefficient estimate and odds ratio of our descriptive variable of interest, *split_i*, are -0.233 and 0.792 respectively (*p-value* 0.028). As such, affiliation with the IIADT program remains associated with a statistically significant lower probability of continuation to the 48 month milestone, given that the individual made it to 36 months.

48 Month Model	Coefficient Estimate	Odds Ratio	Interpretation
split_i	-0.327***	0.721**	Individuals associated with the IIADT program are less likely to achieve the 48 month continuation milestone.
split_afqt3b	0.873**	2.394**	Individuals affiliated with the IIADT & high school graduates (not higher) are associated with higher probability of reaching the 48 month milestone.
*****p<0.01, **p<0.05, *p<0.10**			

Table 19. 48-Month Model Coefficient Estimates and Odds Ratios for Selected Covariates

Another interesting parameter estimate of the 48 month model is the coefficient estimate for the interaction term between *split_i* and *afqt_3b*. As illustrated in the Interaction Plot (Figure 18), an IIADT affiliate is less likely to attain the 48 month milestone over only a portion of the possible interactions. (Figure 18)

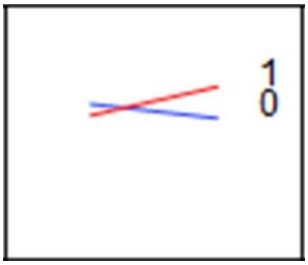

Figure 18. Interaction Plot of Split_I and AFQT IIIB Interaction

Similar to previous models, in addition to examining the effect of the primary variable of interest, *split_i*, investigating potential differences in continuation behavior with respect to FY yields interesting results. Table 20 includes the odds ratios for the effect of each FY included in the 48-month model. A trend similar to previous models exists, wherein there seems to be higher continuation rates in the FY of enlistment earlier in the sequence. The Odds ratios then drop as the table is examined from left to right, indicating that there is less of likelihood to continue to 48 months in the SMCR with later enlistment dates, using FY 02 as the reference year.. Albeit less significant in even a superficial examination of the magnitude, the trend does exist, at least through the FY 07 cohort.

fy_03	*fy_04*	*fy_05*	*fy_06*	*fy_07*
1.242 ***	0.936	0.715 ***	0.741 ***	0.748 ***
*****p<0.01, **p<0.05, *p<0.10**				

Table 20. Fiscal Year Odds Ratios for the 48-Month Model

5. 60-Month Model

a. Model Specification

Similar to the previous four models, JMP includes *avg_pros* and *avg_cons* in the results from stepwise logistic regression. However, with 6,296 observations being those of sergeants and above, and an additional 1,656 values of zero for either *avg_pros* or *avg_cons*, inclusion of pros and cons in the model would cause a reduction of the observations by 37.01 percent from our data set of 21,487 observations. As such, we leave proficiency and conduct marks out of the 60-month model. With *avg_pros* and *avg_cons* excluded, the specified model for describing 60 month continuation behavior is as detailed in Figure 19.

Logistic regression — Number of obs = 21487; LR chi2(28) = 1334.13; Prob > chi2 = 0.0000; Log likelihood = -5978.5948; Pseudo R2 = 0.1004

survive_60	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
split_i	.9334702	.58738	1.59	0.112	-.2177735	2.084714
male	.4122929	.1149002	3.59	0.000	.1870926	.6374932
gt1_depend~s	.8505718	.0640032	13.29	0.000	.7251277	.9760158
ed_level_12	.1977595	.1306324	1.51	0.130	-.0582753	.4537943
ed_level_13	.0164388	.213168	0.08	0.939	-.4013628	.4342404
mw_east	-.0743919	.1255135	-0.59	0.553	-.3203939	.1716102
new_eng	-.2695738	.1450373	-1.86	0.063	-.5538417	.0146942
mid_atl	.0527552	.1275178	0.41	0.679	-.197175	.3026855
sou_atl	-.1504007	.1210262	-1.24	0.214	-.3876076	.0868062
sou_east_c~t	-.1860817	.1445226	-1.29	0.198	-.4693409	.0971774
sou_west_c~t	-.0366954	.1282674	-0.29	0.775	-.2880948	.2147041
west_mtn	-.1678789	.1467128	-1.14	0.253	-.4554307	.119673
west_pac	.0777373	.1248639	0.62	0.534	-.1669915	.3224661
afqt_i	.4094117	.1787772	2.29	0.022	.0590148	.7598086
afqt_ii	.3607406	.1610355	2.24	0.025	.0451168	.6763644
afqt_iiia	.2378104	.164311	1.45	0.148	-.0842333	.5598541
afqt_iiib	-.0618829	.1638661	-0.38	0.706	-.3830546	.2592887
cbt_arms	-.1872681	.0532983	-3.51	0.000	-.2917309	-.0828054
frst_cla~pft	1.890478	.0700776	26.98	0.000	1.753128	2.027827
fy_02	.7092338	.0668153	10.61	0.000	.5782782	.8401894
fy_03	.5884706	.0654596	8.99	0.000	.460172	.7167691
fy_07	-.2213857	.1048015	-2.11	0.035	-.4267928	-.0159785
split_male	-.7675138	.5736895	-1.34	0.181	-1.891925	.356897
split_ed13	-.7862348	.4385884	-1.79	0.073	-1.645852	.0733827
split_gt1	-.4237671	.3097462	-1.37	0.171	-1.030859	.1833243
split_wpac	-.7668407	.3114049	-2.46	0.014	-1.377183	-.1564984
split_afqt2	-.7157858	.2349691	-3.05	0.002	-1.176317	-.2552548
split_pft	.499191	.2434179	2.05	0.040	.0221007	.9762813
_cons	.555194	.2551867	2.18	0.030	.0550373	1.055351

Figure 19. Parameter Estimates for the 60-Month Model

b. Model Diagnostics

(1) Whole Model Test. Figure 20 details the model test figures for the 60-month model. The model, as specified, is statistically better at describing the data set than an abbreviated model consisting of only the intercept (*p-value* 0.0001). The pseudo R2 remains low, at 0.1004 indicating that the model explains 10.04 percent of variability in reaching the 60 month milestone. Additionally, the 60-month model is estimated to be 73.83 percent efficient at correctly classifying individual continuation, as indicated by the ROC curve in Figure 20.

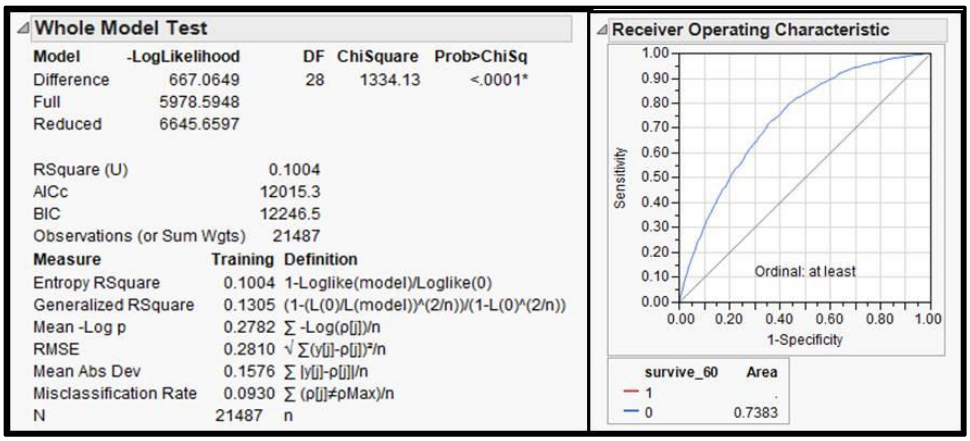

Figure 20. 60-Month Model Diagnostics

(2) Cross Validation. As previously described for other models, the misclassification rate of the 60-month model as well is verified. The whole model test by JMP estimates the misclassification rate to be 0.0930. (Figure 20) Cross validation confirms this estimation of performance.

We randomly select a test set of approximately 20 percent of the data. We refit the model to the training set then classify the members of the test set according to the model's prediction equation. Cross validation of the 60-month model, using a test set of 4,270 randomly selected observations indicates that the model achieves a misclassification rate of 0.0986 (Figure 21).

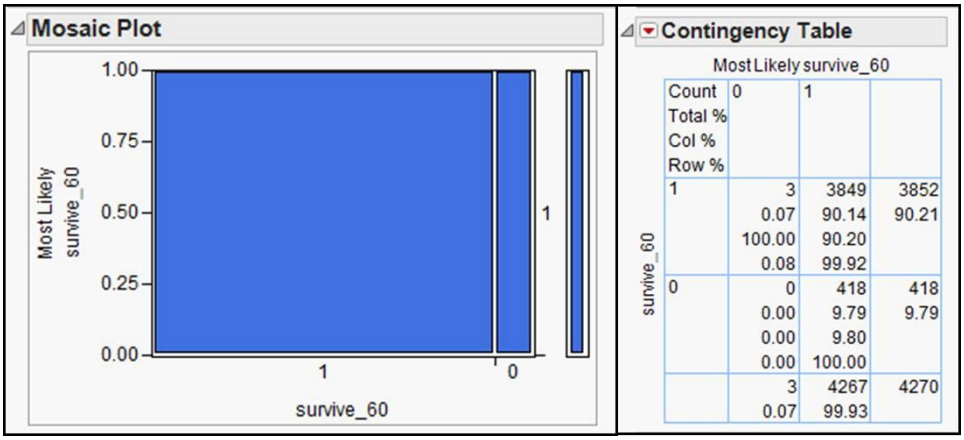

Figure 21. 60-Month Model Cross Validation

c. Results Analysis

The key finding in analyzing the 60-month model output is that IIADT Marines are statistically no different in achieving the 60 month milestone, than those not affiliated with the program (Table 21). The coefficient estimate, and the odds ratio of the primary descriptive variable of interest, *split_i*, are 0.933 and 2.543 respectively. With *p*-value 0.112 > 0.05, however, we lack sufficient evidence to reject the null hypothesis that the estimated difference is statistically no different than zero. As such, IIADT affiliation may, or may not have any effect on attaining the 60 month milestone (Table 21).

60 Month Model	Estimate	Odds Ratio	Interpretation
split_i	0.933	2.543	There is no statistically significant difference between the 2 subpopulations in attaining the 60 month continuation milestone.
split_ed13	-0.786*	0.456*	Individuals who enter the IIADT program after 1 year of college are statistically less likely to reach the 60 month milestone.
*****p<0.01, **p<0.05, *p<0.10**			

Table 21. 60-Month Model Coefficient Estimate and Odds Ratios for Selected Covariates

The dynamic that exists in the interaction between *split_i* and *ed_level_13* is interesting. Particularly interesting is the interaction profile that exists, in which the probability of an individual affiliated with the IIADT program has a lower chance of reaching the 60 month milestone in their contract if they enlist with a year of college already complete (Figure 22).

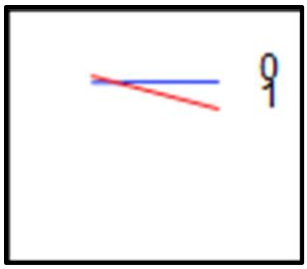

Figure 22. Interaction Plot of Split_I and Avg_Cons Interaction

6. 72-Month Model

a. Model Specification

Similar to the 60-month model, JMP recommends inclusion of the variables *avg_pros* and *avg_cons* in the results from stepwise logistic regression. However, with 5,597 of 15,918 observations being those of sergeants and above, inclusion of pros and cons in the model would cause a reduction of the observations by 35.2 percent. Similar to the 60 month model then, proficiency and conduct markings are left out of the 72 month model in order to retain the observations. Included covariates and parameter estimates are included in Figure 23.

Logistic regression

Number of obs	15918
LR chi2(25)	524.58
Prob > chi2	0.0000
Pseudo R2	0.0500

Log likelihood = −4987.1212

survive_72	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
split_i	.1711476	.2145876	0.80	0.425	−.2494364	.5917317
male	.2742965	.1330173	2.06	0.039	.0135874	.5350056
gt1_depend~s	.3252316	.0595881	5.46	0.000	.208441	.4420222
ed_level_12	.1767047	.1360636	1.30	0.194	−.0899751	.4433845
ed_level_13	.0528027	.222709	0.24	0.813	−.3836989	.4893043
mw_east	.1156896	.1370014	0.84	0.398	−.1528283	.3842075
new_eng	−.0319862	.1609336	−0.20	0.842	−.3474103	.2834378
mid_atl	−.0140631	.1364329	−0.10	0.918	−.2814667	.2533406
sou_atl	−.0789558	.1310117	−0.60	0.547	−.335734	.1778225
sou_east_c~t	−.2657665	.1551716	−1.71	0.087	−.5698973	.0383643
sou_west_c~t	.0441259	.1378393	0.32	0.749	−.2260341	.314286
west_mtn	−.1165581	.1602243	−0.73	0.467	−.430592	.1974758
west_pac	.0908955	.1336263	0.68	0.496	−.1710072	.3527982
afqt_i	.9269132	.1713961	5.41	0.000	.5909831	1.262843
afqt_ii	.851664	.1494149	5.70	0.000	.5588162	1.144512
afqt_iiia	.6297794	.1533427	4.11	0.000	.3292333	.9303255
afqt_iiib	.563102	.1547893	3.64	0.000	.2597205	.8664834
cbt_arms	−.2646768	.0576817	−4.59	0.000	−.3777308	−.1516227
frst_cla~pft	1.343968	.0721974	18.62	0.000	1.202463	1.485472
fy_02	.7814272	.1146768	6.81	0.000	.5566647	1.00619
fy_03	.5341713	.1126088	4.74	0.000	.3134622	.7548804
fy_04	.2827459	.1115454	2.53	0.011	.0641208	.5013709
fy_05	.1752749	.1133405	1.55	0.122	−.0468685	.3974182
split_secent	.9227521	.500261	1.84	0.065	−.0577415	1.903246
split_fy05	−.8370483	.2774212	−3.02	0.003	−1.380784	−.2933128
_cons	.1626009	.2777167	0.59	0.558	−.3817138	.7069155

Figure 23. Parameter Estimates for the 72-Month Model

b. Model Diagnostics

(1) Whole Model Test. Figure 24 details the model test figures for the 72-month model. Specifically, Figure 24 indicates that the specified model is a better fit than the intercept only model, with *p-value* 0.0001. The pseudo R^2 of 0.0500 indicates that 5 percent of variability in the response variable is explained by the model. Lastly, JMP estimates that the specified 72-month model accurately classifies continuation with an efficiency rate of 66.84 percent. (Figure 24)

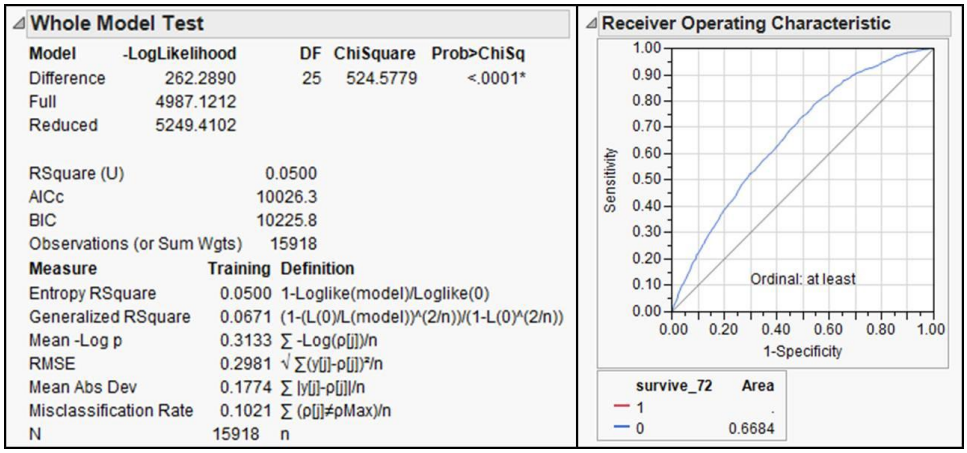

Figure 24. 72-Month Model Diagnostics

(2) Cross Validation. Although the whole model test statistics estimate that the 72-month model achieves a misclassification rate of 0.1021. (Figure 24) Cross validation confirms the estimated performance.

We randomly select a test set of approximately 20 percent of the data. We refit the model to the training set then classify the members of the test set according to the model's prediction equation. Cross validation of the 72-month model, using a test set of 3,145 randomly selected observations indicates that the model achieves a misclassification rate of 0.0995. (Figure 25)

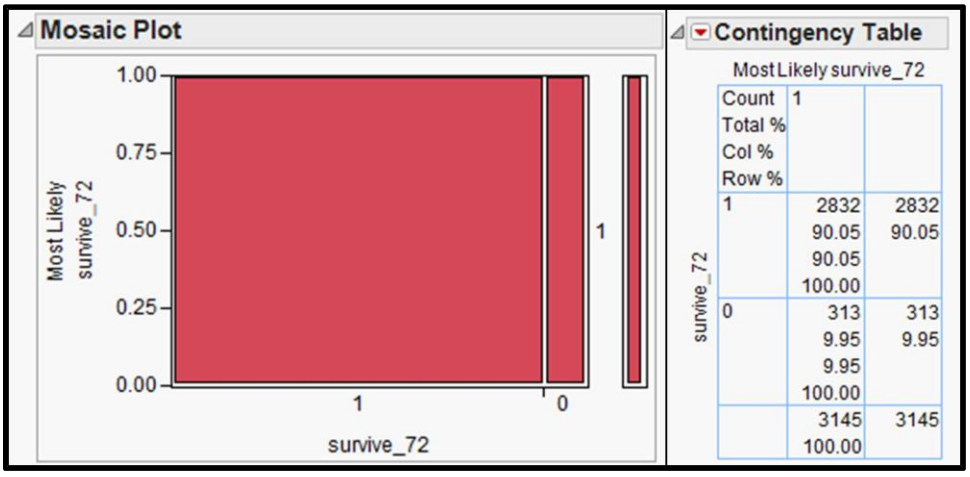

Figure 25. 72-Month Model Cross Validation

c. Results Analysis

The model for this response variable performs so poorly that it is hardly worth discussion. Essentially we can conclude that given that an SMCR Marines makes it to the 60 month milestone, there are few reliable predictors for successfully making it to the 72 month milestone.

C. OVERALL ANALYSIS

This section presents and discusses noticeable trends in the results from regression analysis.

1. Decreasing Positive Effect of IIADT

We notice a generally negative value of the coefficients for *split_i* that trend toward a value of zero. This trend is accompanied by a corresponding change in the odds ratio from a value of less than one to a value that trends toward one (Figure 26). Of note, as the 48 month milestone is passed, the effects of *split_i* are not statistically significant.

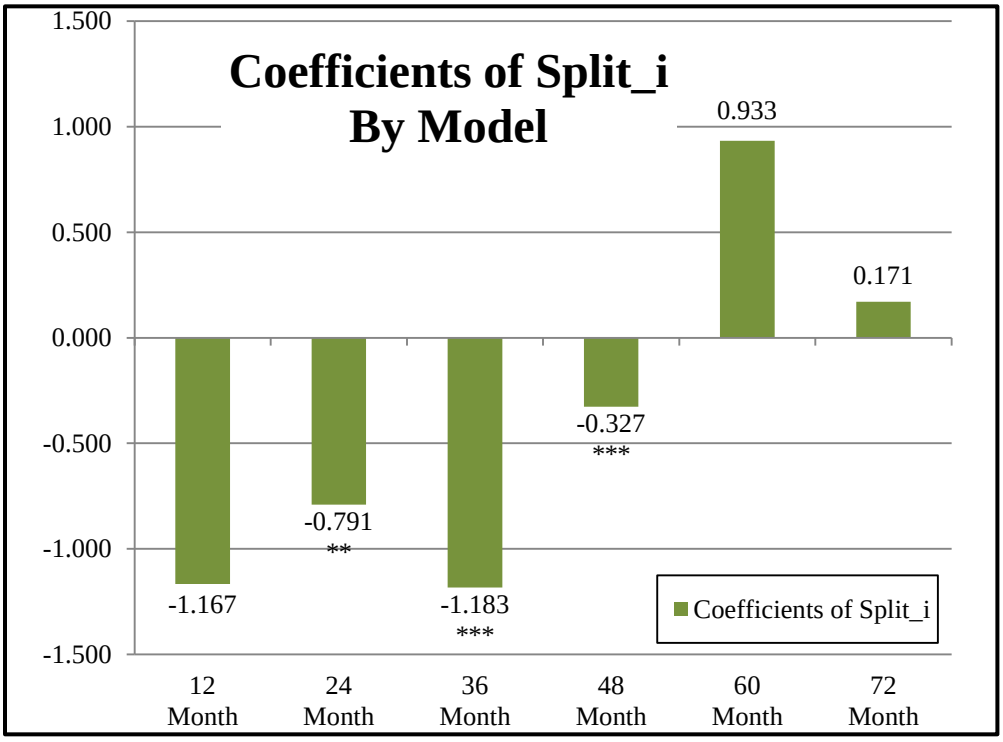

Figure 26. Graphic Representation of the Coefficients of *Split_i*

The practical significance of the coefficients presented in Figure 26 is not obvious. We apply the probability formulae from each of the models to the characteristics of a representative Marine from the data set to determine the cumulative effect of the difference in continuation behavior between IIADT Marines and IADT Marines over time.[49] Although the coefficient for *split_i* begins as negative value, the probability formulae generated by JMP indicate that the negative effect of IIADT affiliation becomes recognizable between 36 and 42 months, as indicated in Figure 27. Moreover, as the values are cumulatively predicted out to the 72 month mark, the difference between Split-I and non Split-I affiliates is 5.6 percentage points, or the difference between 0.646 and 0.591 respectively. In practical terms, if we start with 200 randomly selected Marines (100 each from the IIADT and non-IIADT populations) and observe their continuation behavior, at the end of a six year contract we would only have five or six more non-IIADT Marines remaining than IIADT Marines. The actual difference is quite small.

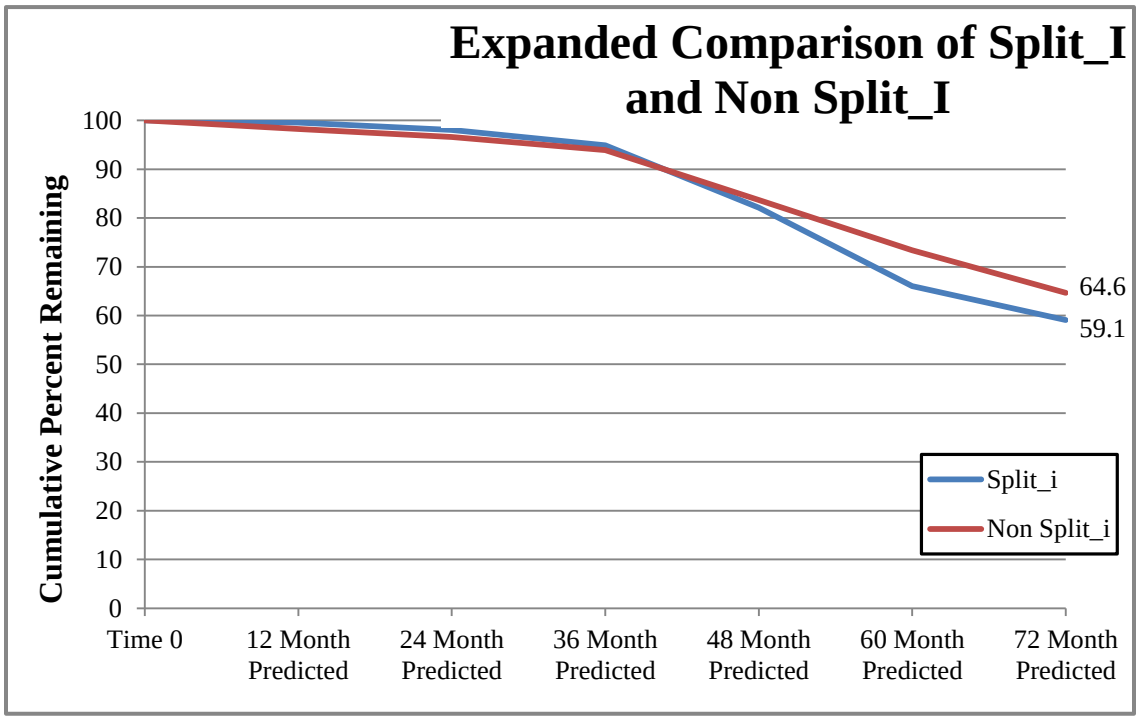

Figure 27. Cumulative Survival Predictions Comparison

[49] Each data set was analyzed separately, but no large differences were noticed in the "average Marine" until the 48 month mark, at which point, the representative Marine does not run a first class PFT.

2. First Class PFT Score Correlation

The odds ratios for the dummy variables *frst_class_pft* are highly significant across the spectrum of models. More specifically, scoring in the first class range on a PFT is associated with a significantly higher probability of attaining the sequence of 12 month milestones. With a significance level above 99 percent (*p-value* < 0.01) at every milestone, achieving a first class PFT is highly significant in predicting continuation (Table 22).

12 Month	24 Month	36 Month	48 Month	60 Month	72 Month
6.855 ***	7.024 ***	5.128 ***	6.977 ***	6.623 ***	3.834 ***
*****p<0.01, **p<0.05, *p<0.10**					

Table 22. First Class PFT Odds Ratios for Continuation

The question that this trend in significance raises is that of whether or not measures like PFT score are an indicator of the level of dedication that an individual has toward honoring their commitment to the SMCR. Physical fitness is a transient characteristic of an individual that, if not diligently maintained, can deteriorate rapidly and cause an individual to subsequently score lower on their PFT. Are these individuals who have the dedication to maintain their fitness level, more dedicated in general?

3. Fiscal Year Effect on Continuation

We include the FY of enlistment of each individual Marine to capture unspecified effects that can influence the continuation behavior of Marine reservists. With a noticeable decrease in the odds ratios of continuation rates across all FY categories, we are able to identify the clear presence of a trend in the data. The downward trend depicted in Figure 28 captures the effects of FY on continuation in the SMCR for our data set.

It is altogether likely that the trends noticed in continuation behavior across the FYs are affected by many factors. Thus, the coefficients associated with the FY capture the effects of many other influences on continuation behavior.

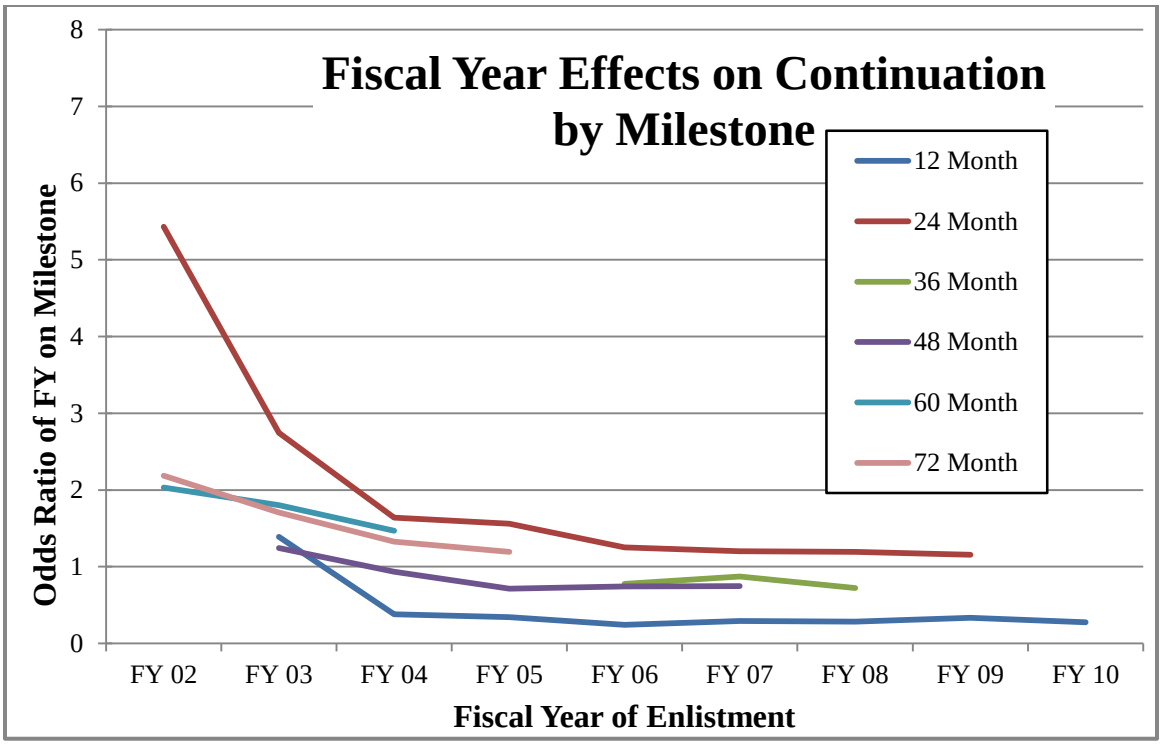

Figure 28. Graphic Representation of the Effect of Fiscal Year of Enlistment

Moreover, the majority of FY dummies run in the various models are found to be statistically significant. In fact, of the 31 different FY dummies recommended for inclusion by JMP, only seven are not statistically significant (Table 23). Specifically, 21 are significant at the 99 percent level (*p-value* < 0.01), two at the 95 percent level (*p-value* < 0.05), and the remaining one at the 90 percent level (*p-value* < 0.10). Coupled with the declining trend in continuation as we move away from FY02 (Figure 28), the significance of the year effect presents an interesting picture of continuation over the past 10 years.

Schumacher contends that activations have a negative effect on retention in the SMCR[50]. However, Schumacher includes both prior service and non-prior service SMCR Marines in his study. With fighting wars in both the Iraq and Afghanistan theaters, the strain on U.S. forces has required the activation of reservists to serve in combat roles, thus providing those reserve Marines a sense of fulfilment that potentially leads to

[50] Joseph F. Schumacher "Forecasting Retention in the United States Marine Corps Reserve" (master's thesis, Naval Postgraduate School, 2005) 40.

increased satisfaction and potentially increased retention. However, there are also those who would argue that increased deployments also have a negative effect on continuation for many reasons such as fatigue, increased distaste for deployment, added stress at home caused by activations, etc. This thesis makes no argument for either point, but rather it points out that the data indicates a declining trend in continuation as we move further and further from 9/11.

	FY02	FY 03	FY 04	FY 05	FY 06	FY 07	FY 08	FY 09	FY 10
12 Month	-	1.390	0.384 ***	0.341 ***	0.243 ***	0.290 ***	0.283 ***	0.334 ***	0.275 ***
24 Month	5.430 ***	2.745 ***	1.639 ***	1.559 ***	1.250	1.201	1.193	1.157	-
36 Month	-	-	-	-	0.774 ***	0.871 *	0. 722 ***	-	-
48 Month	-	1.242 ***	0.936	0.715 ***	0.741 ***	0.748 ***	-	-	-
60 Month	2.032 ***	1.801 ***	-	-	-	0.801 **	-	-	-
72 Month	2.185 ***	1.706 ***	1.327 **	1.192	-	-	-	-	-
*****p<0.01, **p<0.05, *p<0.10**									

Table 23. Significance of Fiscal Year Effects Odds Ratios on Continuation

D. CHAPTER SUMMARY

The multivariate logistic regression results indicate that there is a statistically significant difference in the continuation behavior of IIADT affiliates, as compared to those not affiliated with the IIADT program. Additionally, average conduct markings for individuals are directly correlated with increased probability of attaining the incremental milestones, whereas average proficiency markings tend to have a negative relationship with continuation probability. Another key finding is the relationship between whether or not an individual receives a first class score on the PFT is highly significant in regards to its effect on continuation behavior. This potentially points to a larger dedication effect. This provides a potential area for further analysis.

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V. SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

A. SUMMARY

The primary purpose of this thesis is to address the question: is the continuation behavior of Selected Marine Corps Reserves (SMCR) non-prior service accessions entering via the Incremental Initial Active Duty Training (IIADT) program different from those non-prior service accessions who complete their training in a single increment? Secondly, this thesis examines the data for any year effect trends in continuation after 9/11. Specifically, is there a decline in the effect of unobservable effects, like sense of patriotism or duty, as the horrific events of 9/11 are further removed by time? Lastly, this research investigates the factors affecting continuation to the different annual milestones.

Initial evaluation of the descriptive statistics presented in Table 13 (Chapter III page 31) indicates that using typical measurements of quality, those individuals affiliated with the IIADT program are higher quality than their counterparts. For example, IIADT affiliates have higher AFQT scores, more 1st class PFTs, and higher pros/cons. As well, IIADT affiliates have slightly higher superficial averages in continuation to annual milestones. Superficially, it appears as though IIADT reservists are different.

B. CONCLUSIONS AND RECOMMENDATIONS

1. What, If Any, Is the Difference in Continuation Behavior between IIADT Marines and Non-IIADT Marines?

a. Conclusion

Analysis clearly identifies differences in continuation behavior with respect to IIADT affiliation. More specifically, the following are presented as results from logistic regression:

- Affiliation with the IIADT program is not correlated with different probability of attaining the 12 month continuation milestone.
- Affiliation with the IIADT program is correlated with a lower probability of continuation to 24, 36 and 48 months.

Affiliation with the IIADT program does not have a statistically significant effect predicting continuation differences beyond 48 months.

b. Recommendation

Manpower & Reserve Affairs should quantify the benefits of the IIADT program using a cost-benefits methodology.

2. Is There a Year Effect Trend in Continuation Behavior Related to FY?

a. Conclusion

Trends in the regression results point to an initially decreasing trend in the odds ratios. That trend in behavior tends to disappear between FY 2005 and FY 2006.

b. Recommendation

M&RA should monitor the continuation rates and differences therein between IIADT Marines, and those single increment reservists, in order to determine appropriate policy shifts should they become necessary.

3. What Are the Key Identifying Factors to Predict Continuation?

a. Conclusion

Several factors are identified by this study as being statistically significant in predicting the continuation behavior of Marine reservists, including average conduct marks in grade, first class PFT score, having more than one dependent, and the primary descriptive variable, IIADT affiliation. The most notable, persistent covariate associated with higher rates of continuation probability is whether the individual Marine runs a first class PFT or not. The coefficient for first class PFT, in fact, is estimated with a *p-value* of 0.0001, indicating that it is highly significant.

b. Recommendation

M&RA should continue to track continuation rates and maintain awareness of key performance indicators. Subsequent studies should be conducted periodically to detect any shifts in notable indicators of continuation.

C. FURTHER RESEARCH

We recommend that further research examine the exit behavior of reservists who do not complete their initial obligation. Specific areas of interest primarily include:

- Exit behavior of IIADT participants relative to college graduation
- Behavior trends of reservists exiting the SMCR for the active component, or to other branches?
- Exit behavior into officer accession programs

Results of further investigation should include cost information relative to the IIADT Marine, including a comprehensive cost-benefit analysis to fully examine the added benefits that these "highly qualified" applicants impart upon the Marine Corps Reserves.[51] Results of further research should be provided to policy makers for consideration prior to any changes in the applicable orders and directives relating to the IIADT program.

[51] United States Marine Corps, "Marine Corps Order 1001R.54E: Marine Corps Reserve Incremental Initial Active Duty Training (IIADT) Program," May 1999, http://community.marines.mil/news/publications/Documents/MCO%201001R.54E.pdf.

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APPENDIX REPRESENTATIVE MARINE FOR PREDICTION

In order to predict the real impact of IIADT affiliation on an individual's continuation over time, we develop a representative Marine for each data set. As such, we assign the modal values for each categorical variable and the mean value for each of the two continuous variables (*avg_pros* and *avg_cons*) to hypothetical observations. Subsequent to inserting the hypothetical observations to the different data sets we apply the predictive probability formula to the new observations to observe the calculated probability that they will reach the milestone. Results are compiled into Figure 26, Chapter IV. Values in Table 26 only change by exception.

Variable	12-Month	24-Month	36-Month	48-Month	60-Month	72-Month
split_i	1 / 0					
male	1					
single	1					
ed_level_12	1					
ed_level_13	0					
ed_level_14	0					
gt1_dependent	0					
mw_east	0					
mw_west	0					
new_eng	0					
mid_atl	0					
sou_atl	1					
se_cent	0					
sw_cent	0					
west_mtn	0					
west_pac	0					
afqt_i	0					
afqt_ii	1					
afqt_iiia	0					
afqt_iiib	0					
afqt_iv	0					
cbt_arms	0					
suppt_mos	1					
avn_mos	0					
frst_class_pft	1			0		
avg_pros	43.11	43.12	43.19	43.37		
avg_cons	43.09	43.11	43.17	43.34		

Variable	12-Month	24-Month	36-Month	48-Month	60-Month	72-Month
fy02	0					
fy03	0			1		
fy04	0		1	0		
fy05	0					
fy06	0					
fy07	0					
fy08	0					
fy09	1		0			
fy10	0					
fy11	0					

Table 24. Representative Marine Characteristics for Prediction

Generally, the hypothetical Marine used to predict differences across the models is a single, male, high school graduate from the south Atlantic region. He scores in the category II range on the AFQT. He runs a first class PFT for two years and then does not break the 1st class threshold score. His average pros/cons in grade range from 4.31/4.31 to 4.34/4.34, and he is affiliated with a support MOS. In the 60- and 72-month models *avg_pros* and *avg_cons* are not included.

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